D301.65:24/3

Quarterly

Fall 1983

AIR FORCE ENGINEERING AND SERVICES AFRP85-1

DEC 12 1983

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ENERGY SECURITY

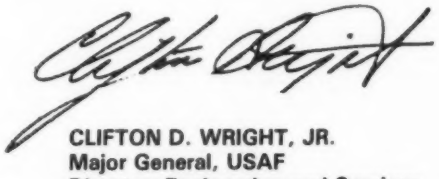
From the Director

The focus of this issue is energy — one of the 10 key action areas in our strategic plan for the remainder of this decade. If you're wondering why energy made the top 10 or if you're thinking that the crisis is over and energy is old stuff, then you need to reorient your thinking. In today's Air Force, energy is critical for two reasons: first, and most important, we need it to fight a war; and second, its ever increasing cost is heavily impacting our budget. It is for these two reasons that we have two important energy programs underway today — a new one called energy security and an old friend known as energy conservation.

Energy security means having our own source of energy for critical needs so that we can carry out our wartime mission independent of commercial sources. This concept has existed for some time, but it has really gained momentum over the last year or so as a result of both accidental and intentional power outages which caused varying degrees of mission degradation. Our role in this growing Air Force program involves ***facility*** energy security. In wartime, we must be able to satisfy the electrical and thermal requirements for key mission facilities under the worst case where our bases are isolated from outside energy sources for an extended period of time. In some cases this is very simple, while in others it is very complex. Thus, we have been working to define the problem and develop guidance on how to attack it. Soon this phase of the program will be complete and then the action will shift to you. Each base and command will have to assess its own energy security posture and act accordingly.

On a national scale, energy conservation still makes sense for all the same supply-related reasons that prevailed in the past. But in our business — "Energy Conservation Makes Cents!" This slogan is not just a play on words. Every year the increased cost of energy takes a bigger bite out of our O&M budget because the unit cost is rising faster than our consumption is falling. This means we have fewer dollars available for maintenance, repair and construction. Our Center at Tyndall has an excellent Utility Rate Intervention Program which is helping us hold costs down; however, the primary solution to the cost problem is still reduced consumption. We've made a lot of progress in conservation during the last 10 years, but most of it occurred in the '70's. In FY 82, we fell short of our goal for the first time and the trend is in the wrong direction. We must reverse this trend and I'm convinced we can through renewed awareness and, more importantly, through investment in concepts and technologies that we haven't tried in the past. For example, I am certain that we can significantly reduce consumption by making our HVAC systems operate more efficiently and then keeping them in that mode via a strong recurring maintenance program. To achieve this, we've instituted several programs which you'll read about in this issue, and subsequent issues, of the ***Quarterly***.

I urge each of you to do your part in emphasizing energy — both security and conservation. At the Center and the Air Staff, we're working hard on initiatives in both these areas, but we can only do so much. The rest is up to you!



CLIFTON D. WRIGHT, JR.
Major General, USAF
Director, Engineering and Services

Making sure that our key facilities have secure energy: it is one of our most important goals.

Quarterly

AIR FORCE ENGINEERING AND SERVICES

AFRP 85-1 Vol. 24 No. 3

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The **Air Force Engineering and Services Quarterly** is an official, non-directive publication of Headquarters United States Air Force, published quarterly under provisions of Chapter 12, AFR 5-1. Its purposes are to

- Attract highly qualified personnel to the Air Force Civil Engineering and Services career fields
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- Promote professionalism, and devotion to duty.
- Stimulate planning for the wartime survival of our personnel, weapons systems and facilities.
- Develop Air Force stewardship of the well-being, quality of life and facilities support to Air Force personnel and their families throughout the world
- Promote awareness of the efficient, effective and essential facilities needs of the Air Force.
- Transfer knowledge of Air Force Engineering and Services' technical and scientific achievements.
- Promulgate teamwork among the Air Force Engineering and Services' total force.
- Achieve a professional dialogue to enhance the thought, development and contributions of the Engineering and Services team worldwide.

The **Quarterly** editorial offices are at HQ Air Force Engineering and Services Center, Tyndall AFB, Fla. Contributions, suggestions and criticism are welcome. Opinions expressed do not necessarily reflect the official viewpoint of the Department of the Air Force, the Director of Engineering and Services or the editorial staff. Authority to publish this periodical automatically expires in January 1984 unless its continuance is authorized by the approving authority prior to that date. The use of a name of any specific commercial product, commodity or service in this publication does not imply endorsement by the Air Force.

ENERGY SECURITY

by Stephen A. Hathaway and
Capt. Paul C. Vitucci

Our aim is to gain control of the two great treasure houses on which the West depends: The energy treasure house of the Persian Gulf and the mineral treasure house of central and southern Africa.

Leonid Brezhnev[1]

Nearly everybody has his favorite humorous anecdote about the time the power went out. But things were not so funny late last year when, under close IG supervision, commercial power was cut unexpectedly for several days during exercises at a CONUS and an overseas base.[2] (See "Power-out at Minot," this issue.) Resulting events uncovered the need for better contingency planning, demonstrated the great importance of facility energy to mission, and illustrated why energy security has become the highest DoD and Air Force energy priority.

The rules have changed. Since our modern-day facility energy programs began in the early 1970s, the catchwords at MAJCOMs and bases were to save BTUs and energy dollars and to reduce dependence on foreign oil. Through the diligence of the entire Air Force community, our oil and gas consumption has plummeted, we have an excellent heating plant modernization program, our operational efficiencies are on the rise, and growths in electricity use and overall facility energy costs are at least predictable. But, now we are faced with a new challenge — attaining and sustaining energy security.

Policy

Prevailing energy security policy is in the FY85-89 Defense Guidance and in guidance given to MAJCOM vice commanders by Office of the Chief of Staff in October 1982.

The current defense guidance instructs defense components to program resources for the following (in descending order of priority):

- Ensuring energy security for key facilities;
- Testing synthetic and poorer quality petroleum fuels;
- Developing more fuel-efficient designs for weapons systems; and
- Complying with goals in the Defense Energy Management Plan and the National Energy Conservation Policy Act.[3]

Forging this guidance began in December 1981 when the Joint Logistics Commanders (JLC) established an ***Ad Hoc*** Energy Initiatives Group, chaired by the Air Force, to determine if the JLC should undertake new energy initiatives. (The Joint Logistics Commanders include the commanders of Air Force Logistics Command, the Air Force Systems Command, the Army Materiel Development and Readiness Command, Navy Material Command, and the Marine Corps deputy chief of staff for Logistics.) The group found that the ability of the services to accomplish their missions was directly tied to the availability of energy for mobility and facility needs, and that all forms of energy were vulnerable to sudden, unexpected disruption. These findings were supported by General Accounting Office analyses of national petroleum and electrical power vulnerabilities,[4,5] assessments of military energy vulnerabilities at a DoD/DoE Energy Vulnerability Workshop in November 1981,[6] and experiences during past power outages at a number of military locations. In September 1982, recommendations for revising the defense guidance were passed from the JLC through the Secretary of the Air Force to the Undersecretary of Defense, were reviewed by the Defense Energy Policy Council, and on Mar. 1, 1983, were signed by the Secretary of Defense.

In October 1982, the Office of the Chief of Staff gave MAJCOM vice commanders facility energy policy guidance for planning, formulating policies, and making fiscal year programming decisions. The major points of this guidance are:

- Air Force installations should be energy self-sufficient to the greatest degree practical, particularly for critical mission requirements.
- Strong programs should be established to reduce energy consumption, and to develop and implement reliable, cost-effective energy systems to meet current and future needs, with high priority on using indigenous energy and material resources.
- Facility energy should be addressed specifically and separately in all MAJCOM and Air Staff near-, intermediate-, and long-term planning and in the Air Force Global Assessment.
- Progress toward facility energy goals should be reviewed annually and goals revised upward as appropriate to reflect past accomplishments, and the necessity for future energy security.

These four items are vital building blocks of energy security. Energy security is a goal now firmly established on the planning horizon and is an objective in the Engineering and Services Strategic Plan.[7] It entails energy generation, distribution capability and energy supplies to satisfy the electrical and thermal requirements of installations, particularly those of key mission facilities at which the energy supply is vulnerable to disruption. In practice, the concept must be applied consistently with mission. For instance, a mission resource which deploys during contingencies may need only current levels of emergency power to insure mission accomplishment. However, other

ACKNOWLEDGEMENT:

The authors are indebted to Bruce W. MacDonald, formerly of the Energy Group, Headquarters Air Force Engineering and Services Center, now the deputy base civil engineer at Scott AFB, Ill. He provided invaluable assistance in the formulation of energy security policy and initiatives.

bases such as depots — which are charged with resupply and equipment maintenance and management — must continue to function to satisfy the needs of the operating commands. In short, our energy policies now address directly the survivability of the complex logistics tail through which most of our installations receive their energy from the civilian sources outside the fence. According to the Deputy Assistant Secretary of the Air Force for Installations, we must be prepared to perform our missions with this "umbilical cord" cut.[8] This exigency must be reflected in all levels of planning, including plans for base operation, mobilization and recovery.

Past Studies

Numerous past investigations have pinpointed specific energy security issues and supported formulation of a contemporary energy policy responsive to mission requirements. These investigations are highlighted here, and should be studied carefully by all personnel who are seriously interested in enhancing our energy security.

Overall energy needs of facilities have been addressed in four key studies. The first was conducted by the Air Force Wright Aeronautical Laboratories (AFWAL) in 1978 and published as the ***USAF Terrestrial Energy Study.***[9] The report is a comprehensive review of installation electrical and thermal requirements and of current and emerging technologies capable of meeting them. The report found energy technology developed in the National Energy Program would have limited benefit to the Air Force because of shortfalls in reliability, logistics supportability, mobility, operation in extreme environments and survivability. A recommendation of this study was that the Air Force adopt a comprehensive energy development plan. The recommendation was followed up by the Engineering and Services Laboratory in 1979. In January 1982 the lab published its Air Force Facilities Energy R&D Plan which contains specific energy consumption data and requirements for all major facilities.[10]

The lab also conducted two key studies of remote site energy needs. The first, published in July 1979 as "Analysis of Remote Site Energy Storage and Generation Systems,"[11] identified the feasibility of using standardized wind turbine systems at high latitude locations to generate power in the 5-10 kw range. Establishment of the FY90 Air Force goal of energy self-sufficiency at remote sites encouraged the laboratory to conduct a comprehensive analysis of the potential survivability of alternate energy technologies in remote Air Force locations.[12] This report contains empirical energy use data for U.S. remote sites, as well as information on wind and solar energy resources.[13] The study found that alternate technologies (i.e.; solar, geothermal, wind) as developed in the private sector and the National Energy Program would not survive peacetime environmental and wartime threats without costly hardening and modifications to ensure high availability.

In December 1980 the Federal Emergency Management Agency (FEMA) published its ***Energy Vulnerability and War*** which identified the vulnerability of national energy systems and recommended the dispersed use of renewable energy to achieve secure national energy self-sufficiency.[14] The FEMA report pointed out potential nuclear effects on our national energy infrastructure and promoted fundamental changes in national policies and goals in order to strengthen energy emergency/contingency planning.

New awareness of threats and the vulnerability of energy systems at critical defense locations were catalysts of a major new DoD undertaking in December 1981. The Power Reliability Program (PREP) began under direction of the Secretary of Defense to enhance the reliability of power supply to eight critical C^3 facilities, most of which belong to the Air Force. The Army is the DoD Executive Agent and AF/LEEEU is the Air Force manager. PREP arose as a result of documented concerns about the abilities of our electronic eyes and ears to function in newly defined threat environments.[15] PREP is developing design criteria for power upgrade which will commence with the FY85 MCP. Already, PREP has identified many R&D needs including electromagnetic pulse hardening, parallel ground compatibility and nondisruptive testing for survivability.

From July 1981 to August 1982, the Engineering and Services Laboratory sponsored an investigation by the Los Alamos National Laboratory into several broad energy supply issues. The early findings of this investigation were presented at a November 1981 Joint DoD/DoE Energy Vulnerabilities Workshop and indicated the need for both further in-depth studies and policy revisions.[16] A follow-on in-depth investigation was sponsored by the lab which focused on seven AFLC facilities: the five air logistics centers in Georgia, Oklahoma, Texas, Utah and California, and Wright-Patterson AFB and Newark AFS in Ohio.[17] This investigation revealed specific on-base energy deficiencies and their respective peacetime and wartime mission impacts, and it recommended a broad spectrum of corrective measures, including modifications in operational and O&M procedures, management changes, and the military construction program. A by-product of this study was a simple methodology of analysis which would unmask problem areas without complex and resource-intensive multiday power outage tests.

As an adjunct to this study, DoE investigated the resilience of utility power at one logistics center.[18] The DoE study indicated generically the relative ease with which power supply could be disrupted for many weeks by simple acts of sabotage with conventional nonmilitary munitions which are easily obtainable in the private sector.

Taken together, the investigations outlined above revealed numerous deficiencies in energy programs and policies.

- First, our foremost deficiency was continued heavy dependence on external sources of energy to meet our critical mission requirements despite strong cautions against this for nearly a decade in the annual Defense Guidance and Air Force energy plans.
- Second, our programs displayed apparent weaknesses in commitment, in orientation to mission and economy, in responsiveness to future needs, and in the use of indigenous energy and material resources.
- Third, we were heading toward corporate failure to adequately plan our facility energy needs and affairs. As a result, many limitations, deficiencies and issues for management attention may have gone by the wayside. These could only contribute to weakness.
- Finally, our programs and policies have tended to be driven more by energy goals and less by those qualities which were described in "Readiness, A State of Mind," by Gen. Bryce Poe II, (USAF Ret.), ***Air Force Engineering and Services Quarterly,*** Spring 1982. Our energy affairs should have no room for people who have "trained out" warfighting leadership and replaced it with business-as-usual analytic thinking based on peacetime economics and a false security that nothing bad can ever happen.

These four factors are at the foundation of our energy security policy cited earlier in this article.

What's Coming Up

You'll be hearing from us over the next few months as we continue to assemble tools, guidance and new initiatives to solidify the energy security program.

- First, we have engaged Los Alamos to put together a handbook methodology for base people to conduct energy vulnerability assessments efficiently as part of the annual program development process. The handbook will use methods developed by Los Alamos in their logistics center vulnerability study

mentioned above and, after testing at six bases, CONUS and overseas, the handbook will be distributed in October 1983. This will provide ample time for base-level assessments to be done under the auspices of the Base Energy Conservation Task Groups and for any needed inputs to be developed for the FY87-91 POM. The Engineering and Services Laboratory will conduct detailed vulnerability analyses at eight bases under five commands in FY84 and 85, and will help in any revisions that need to be made in the handbook.

- Second, we are assembling guidance for creating an energy security program element and program decision package at MAJCOM level. If approved, this guidance will be distributed early in FY84, providing a vital programming tool.
- Third, we are working on redefining our liaison with DoE, which is currently governed by a Joint Memorandum of Understanding (MOU) that expires Dec. 30, 1983. This is being done through a Facility Energy Security Working Group of the Defense Energy Policy Council (DEPC). Key items proposed in the new MOU are more technology transfer products, aid in identifying support requirements of new technologies, design reviews, and annually programmed joint projects to benefit our energy security initiatives.
- Fourth, we have begun a thorough reexamination of energy technologies in order to identify those responsive to energy security and our role of providing support to Air Force weapons systems.[19] As part of this reexamination, we have initiated a contract for long-term planning (i.e., post-2000) which will both give us a solid technology assessment and forecast, and "pull" our annually revised 10-year plan.
- Finally, we are developing a system to manage the energy security program with well-conceived goals, audits, and feedback. This system will be in harmony with initiatives being undertaken by the DEPC to incorporate energy outage scenarios into the Master Scenario Event List (MSEL) for exercises conducted by the Office of the Joint Chiefs of Staff.

These five initiatives will complete the essential infrastructure for a sound Air Force energy security program. We expect they will all be completed well within the next eight months, at which time we will effectively transfer all self-evaluation, project development and programming tools to the MAJCOMs.

High Merit

Not so long ago, many of us may have thought jokingly that energy denial might be a positive strategy to reduce, and even stop, facility energy consumption and hence achieve our major corporate energy goals. But since then we have come to learn that denial could be a grim reality, with adverse impacts in all facets of Air Force operations. Our adversaries' intentions to deny us access to the energy and mineral "treasure houses" overseas are sobering. Just as sobering are the potential consequences of insecure mission-essential energy supply to and within our bases. Vulnerability assessments undertaken during the past three years have shown vividly that, while facilities account for only about 29 percent of all Air Force energy consumed, the merit of facility energy to the Air Force mission is high.

The energy security program has emerged at a time when the Air Force's PROJECT WARRIOR has taken full flight. We will do well to conceive and plan our energy affairs in the same warfighting terms, and ensure our decisions and actions contribute ultimately to "bombs-on-target." The consequences of not doing so are unthinkable.

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Power Out at Minot

by Col. Walter (Tom) Whitman, III, and Maj. Daniel J. Barker

Did you ever stop to really think about what would happen if your base lost all commercial power for an extended period? Can you fulfill your peacetime and wartime mission using only backup emergency power systems?

These questions were raised by the Assistant Secretary of the Air Force for Manpower, Reserve Affairs, and Installations. He expressed a desire to test the "current level of mission vulnerability to sabotage or other supply disruptions of base power sources."

The men and women assigned to Minot AFB, N.D., recently got a chance to answer those key questions. Minot AFB was selected to be the first site of a test to create a deliberate commercial power outage during a period of increased activity to allow measurement of the adequacy of the system to sustain mission support during simulated wartime tasking. In English that means, "Could we go to war with the power off?"

This article will address four general areas associated with the test. First, we'll discuss why Minot was chosen for the test. Then we'll take a look at some of the preparations. Third, we'll review the three-day exercise. Finally, we'll address some of the significant lessons learned.

Selection

Why Minot? One major consideration for selecting Minot was its scope and diversity of mission. Home of the SAC Strategic Projection Force, the 57th Air Division Headquarters is located on Minot. Operationally, Minot is a SAC dual-wing base. The 91st Strategic Missile Wing, with its fleet of 150 Minuteman III ICBMs, is the host wing. The 5th Bombardment Wing, with bomber and tanker squadrons, is the other SAC wing. The 5th Fighter Interceptor Squadron with its F-106s is a major tenant on base. Another reason for choosing Minot AFB was the isolation (some 15 miles north of the city of Minot and 40 miles south of the Canadian border), although even with the isolation, we enjoy extremely strong civilian community ties. In other words, we could conduct such a test without a lot of attention and with easily handled civilian coordination. A final consideration was the relative simplicity of the overhead primary and secondary electrical distribution system on base, permitting a variety of switching options. Following the selection decision, the next step as far as Minot AFB was concerned was to prepare for the test.

Preparations

Although Air Force preparations for the test began months before Minot was ever selected, most of those preparations are not covered in this article. Only our preparations at Minot will be addressed. In July, a team from HQ SAC/DEM took a look at our electrical distribution system as part of a long-range upgrade program. We found out later they were really taking a first-hand look at our "switching" system as a prelude to our "power out" test. Our wing commander, Col. Richard P. Jaques, was notified of the test a couple weeks prior to the start date. This notification was accomplished so he could ensure the base was capable of supporting the test and that all preliminary safety aspects and exceptions had been reviewed. The BCE was taken in as a trusted agent by the wing commander at the end of the week before the test.

Representatives, more than 80 all together, from DoD, the Air Force IG, SAC, TAC, PACAF, and USAFE staffs descended on Minot Sunday, Aug. 8, 1982.

The North Dakota Utility Company was notified about two hours before the test so they would be prepared for the sudden loss of a major user of electrical power.

The local unit of the National Federation of Federal Employees was notified Monday, Aug. 9. We did encounter some individual complaints from the civilian workforce and the local union representatives due to the need for some changed work hours and overtime requirements, particularly in Civil Engineering. However, the vast majority of the civilian workforce rolled up their sleeves and pitched right in — a super effort on their part.

The entire base population was notified of the test Monday. The notification was handled throughout the day at mandatory safety briefings, conducted principally at the base theater. The actual start of the power-out portion of the exercise was not divulged during these briefings. A key part of the notification was the evaluation team input that the exercise scenario would be an expanded local generation exercise similar to an ORI, but "under no circumstances" would this test be considered as a unit ORI, nor was there to be any IG rating. The five-day exercise was developed with a 72-hour core period of commercial power interruption.

Another key element of the preparation was the need to identify certain "power off" exclusions that did not directly affect the mission. The evaluation team came in with some six or eight excluded facilities or activities that were expanded to 14 or 15 by the start of the exercise. Some examples included: hospital and medical facilities, dormitories, military family housing, transient facilities, commissary, BX, bank, post office, contractor facilities, and so forth. There was some discussion about what else the base thought should qualify, but most of the exclusions recommended by the base, such as the child care center, and officers and NCO clubs, did not make the list — power was cut.

The very first thing on the morning of Monday, Aug. 9, the CE evaluation team

chief and the eight other CE evaluators provided an informal in-brief to the BCE and key members of his staff (deputy BCE, ops chief, the electrical superintendent and his foremen, the mechanical superintendent and his foremen, water and waste foreman, chief of DEE, and our electrical engineer). This was followed by a coordinated effort to develop a pre-switching plan and a power-off, power-on plan. The plans and associated checklists were developed and pre-switching accomplished late Monday afternoon. With exclusions approved all over the base, turning the power off was not simply a matter of cutting our seven primary circuits. We also had to be able to quickly return critical facilities [weapons storage area (WSA), bomber alert area, etc.] to commercial power in the event that real world considerations further complicated the problem. Our switching involved dropping the primary circuits off, then opening and closing various electrical cutouts and oil circuit reclosures (OCR), followed by turning on a select few primary circuits to feed activities excluded from the power-off exercise. Our plan done, we were ready to start "the three days without."

Exercise

At 8:30 a.m., Tuesday, Aug. 10, the termination of commercial electrical power began. The BCE had been advised about 12 hours earlier of the exact start time. He was allowed to notify the fire chief and the chief of operations one hour before it began. Many other agencies (data automation, activities with remotes, command post, various job controls, etc.) were notified 15 minutes early. It actually took about three hours to complete the "power off" condition so the excluded facilities remained on commercial power. Safety was the major concern during the phase in which we were cutting power. The procedures and checklists that were developed Monday were followed. Positive radio control was maintained. All instructions were acknowledged before taking action and all completed actions were acknowledged.

Our standby generators were correspondingly brought on-line, some through the automatic start mode, some through manual start by the various base users, and some through manual start by our power production personnel. At the beginning of the exercise, we had a total of 58 standby generators — 49 real property installed equipment (RPIE) and nine items of other authorized generating equipment (equipment authorized, inventory data — EAID). Four of the 58 were down for parts, four generators failed to start at various times going into the exercise, and five failed after being in operation for varying periods of time.

Along with the power-off initiation came the notification for a Prime BEEF recall and subsequent simulated deployment of 275 military personnel. Had we encountered some sort of actual emergency beyond the control of the remaining workforce, we could have recalled any or all of the Prime BEEF personnel; but otherwise, they were considered not available — they were deployed.

The civil engineering CONUS sustaining force of more than 70 military and more than 150 civilians now had the ball. The missile reconstitution force and alternate base recovery teams took some more of our military people, so we quickly realized we were critically short of some technicians, principally in the electrical areas. As a result, we realigned the schedule of our civilian and remaining military workforce so that "key players" — electrical, refrigeration/heating, water and waste, and our damage control center personnel were on two 12-hour shifts. (Fortunately the evaluation team also brought civilian overtime money with them — we "spent" more than $6,000 in civilian overtime.)

Because it was an exercise, we had to establish an augmented damage control center (DCC) staff to direct and control the power outage and to respond to non-exercise real world happenings. Each 12-hour DCC shift was established with personnel to accomplish the following:

- Shift supervision
- Radio communications
- Sequence of events (documentation)
- Generator status and update
- Phone calls/exercise play
- Phone calls/real world
- Electrical supervision
- Electrical engineering

The maintenance of accurate documentation was a must — not only to ensure the DCC knew what was going on — but also to use during the critique following the exercise, helping determine what went right and what went wrong. A voice recorder would have been a real asset.

Even with our realignments we were still short of personnel, so we requested and received approval for withholding 12 Prime BEEF people to fill our shortages in the CONUS Sustaining Force: four power pro specialists, three exterior electric specialists, two interior electric specialists, one POL maintenance specialist, one production control specialist, and the chief of operations.

One other key item that had to be established early in the initial phase of the exercise was the listing of priorities controlling use of the available EAID units. The priority list would prove valuable and flexible — valuable in highlighting needed support areas and their relative priority, and flexible in reorienting the priorities as conditions dictated. As we shifted from initiation to power-out operations and support, we gained a good deal of practical and realistic appreciation for what can be done under rather adverse conditions.

Once commercial power had been terminated, the bulk of the civil engineering workload fell on our power production shop and our damage control center. The DCC was headed by the deputy BCE on one shift, and our civilian deputy operations chief on the other. The ops chief and BCE rotated shifts on the wing battle staff. We had two power production crews of two men on

Pre-switching preliminary planning

Strapping a 100kw generator

duty for each shift. These folks performed yeoman duty, responding to refueling and maintenance requirements, and at the same time moving and connecting EAID generators to various locations. The remaining shops, in particular the interior electric shop, helped out as required, but the bulk of mission support fell on the power production people.

Generator refueling proved to be a formidable but manageable task; we had only one generator stopped for a few minutes when it ran out of fuel. Our refueler was delayed getting out of the WSA. Maintenance requirements, such as needed oil changes and repair of generators, accounted for a lot of the time spent by power production. Troubleshooting and parts availability were critical items. Cannibalization and ingenuity were the order of the day.

We did run into some problems switching EAID generators from one facility to another and with wiring in EAIDs to replace failed RPIE generators. In one case, we continued to shuffle one EAID generator from the POL refueling point to the bomber alert facility to the water demineralization plant and — in a couple of instances — to the dining hall and then back, all over again. This generator shuffling entailed a sizeable toll on our already short manpower.

Many things surfaced during the test that don't normally come into play during simulation. Some were "surprises" for just a few people and some to almost everyone. Below is a checklist of considerations:

- Klaxon System: Was it on emergency power? All or part?
- Alarms/JSIIDS, ADT, Fire: All or some backed up? Source?
- Base Siren(s): On back-up?
- Telephones: Single line instruments — do they ring? Multiple line instruments — ring? Light up? Primary/secondary crash-back-up source? Fire phones — do they work?
- Comm: Where is the back-up for various Comm systems located? Pagers — are they backed up?
- Sanitary Facilities: Are all lift stations on back-up power? What about basement facilities (sump pumps and bathroom lift pumps)?
- Emergency Lights: How long will they last? How do you recharge?
- Cypher Locks: What happens?
- Traffic Lights: Necessary, how do you compensate?
- Water Supply: On back-up power? Do you ration?

We learned quite a bit about the peculiarities of these things (and others) at Minot; do you know what will happen at your base?

Nothing has been said about the missile field so far. That's because civil engineering had absolutely no problems with our top side launch control facilities (LCF) support building generators. Two out of 15 were exercised and both worked fine. Had we had major problems with these generators, we would have been hard pressed to provide timely response and still adequately support on-base requirements.

We managed to survive the outage without any major disruptions. Thursday, Aug. 12, we were told to begin turning the power back on. Our recovery went smoothly with only a handful of people wanting to know when it was their turn for power to be restored. Our power-on switching was conducted just as carefully as the power-off switching. Positive radio control was maintained. All agencies were notified of the initiation of return to commercial power. Our power-off checklist was used as a power-on checklist (in reverse). Needless to say, the aftermath of the exercise resulted in numerous lessons learned.

Lessons Learned

The "bottom line" to the exercise was that the bomb and missile wing and the TAC fighter squadron proved emergency war order (EWO) mission accomplishment was never in doubt even under an extended commercial power outage. There were difficulties and "workarounds" — but the EWO mission generation was never jeopardized. We learned early in the exercise that more EAID generators are a must. The flexibility offered by having mobile electrical power was a lifesaver. We intend to install more electrical "quick connects" at key facilities to reduce hookup times. We noted that many of our RPIE generators were capable of taking more connected load. In many of these underused locations, key functions were not connected. Of course, we also noted that "more is better." More or bigger RPIE generators for certain functions would have greatly enhanced the total operation, particularly in an extended commercial power outage.

One significant result of the exercise was the creation of an ***ad hoc*** "power-out" committee chaired by the missile wing vice commander. The purpose of the committee will be to set priorities for the 60 work requests for standby power that were developed from the test results. Then we, civil engineering, can evaluate and price out those with the higher priorities. Following the evaluation and pricing, the ***ad hoc*** committee will recommend to the wing commander how much money it feels ought to be dedicated to improve the standby power capability.

***Col. Walter (Tom) Whitman III** is chief of the Peacekeeper task force, assigned to the deputy chief of staff, Engineering and Services, Headquarters Strategic Air Command, Offutt AFB, Neb. He previously was base civil engineer and commander, 91st CES, Minot AFB, N.D. He earned the bachelor's degree in Civil Engineering from Auburn University, and the master's degree in Business and Management from the University of Utah. He has previously served in NATO, USAFE, PACAF, ATC and Vietnam.*

***Maj. Daniel J. Barker** is chief of operations for the 91st CES. He holds a bachelor of science degree in Civil Engineering awarded at the Air Force Academy, and the master of science degree in Facilities Management from the Air Force Institute of Technology. He has served in USAFE, at AFLC and has held base level assignments in operations, programs and engineering.*

We also learned some valuable lessons in personnel availability. As mentioned earlier, we identified some real skill imbalance problems within some of our key shops. Power production would have had one civilian and three military to handle the entire generator support tasking 24 hours a day if we had not withheld some people from Prime BEEF. Other skills were similarly strapped for manpower. We had to take a hard look at our manning structure for the CONUS sustaining force. We have subsequently identified our reposturing needs.

One major feature of the test that was discussed, but was not really a factor during this specific test, was the seasonal timing. Had the test been held at Minot in January, the cold weather might have made a tremendous difference in the outcome. Besides the obvious problems with heat loss for lack of circulating pumps and electrical burner motors, how fast can you move EAID generators across roads covered with snow and ice? How difficult would it be to hook up a set of generator leads to the split-bolt connector at minus 50 to minus 80 degrees? Refueling problems would increase significantly.

Connecting an EAID at the POL yard

Conclusion

The exercise was a realistic test of the capabilities of our units to accomplish their EWO missions without benefit of commercial power during the non-winter months. We are not sure if any conclusions can be drawn about what would have happened in winter.

One of the most rewarding results of the exercise was the manner in which everyone responded. There was a real sense of urgency — a sense we sometimes have trouble generating during ORI's, etc. We were really proud of the CE personnel and, in fact, the evaluation report cites the "exemplary" performance of the 91st CES. We are convinced more than ever that our people can and will do the job when the chips are down.

Having said all this, our next point may seem inconsistent. Was the test a success or failure?

A success? We "done good" for a three-day period in the summer. We proved we need more generators — especially if you relate the exercise to a winter environment. We showed we must "beef up" (pardon the pun) our CONUS sustaining force.

A failure? We certainly didn't fall on our face and thereby prove our emergency power system inadequate. If anyone interprets this test to mean that we can perform our EWO mission without commercial power for an extended period of time, ***anytime*** — they're wrong.

It is our belief that the test was an unqualified success — as a first step. As the draft evaluation report indicated — "more exercises of a longer duration and increased participation are needed."

Our advice is to sit down and seriously think about what would happen at your base if you lost all commercial power. And don't do it in isolation. Get the entire base involved, and finally — check it out. Pull the plug and see what happens. You'll probably still identify some surprises. However, what you'll gain for enhanced readiness can't be denied.

Generator refueling method

CESMET tips

The Air Force Civil Engineering and Services Management Evaluation Team (CESMET) reviews, evaluates and assists base civil engineering and services functional areas in accomplishing their mission in the most effective and efficient manner. This department is designed to pass along new ways to do the job better.

Of Special Interest

Work classification and approval authority limitations are viewed as obstructions or bureaucratic delays to obtaining improvements for Air Force facilities. Let's stop for a moment and analyze two questions:

- "What is the purpose of our base civil engineering organizations?"
- "Why are these limitations placed upon us?"

In peacetime, the primary purpose is to maintain, repair and sustain Air Force property to a state of readiness. The base civil engineer also has the authority to perform minor construction to give base commanders built-in flexibility to meet mission changes. This flexibility is, by design, limited to protect the primary maintenance and repair mission and to insure that the public interest on the expenditure of tax dollars is maintained. We must keep these basics in mind when we classify work.

Congress, through Public Law, has established limits (in dollars) by classification of work. Work is defined as the effort expended in the care, upkeep, construction and improvements of Air Force real and installed property and is subdivided into classifications which are:

- Class M — maintenance
- Class R — repair
- Class C — construction
- Sub-Class MC — minor construction

Approval authority limits are specified in AFR 86-1, Chapter 2; all or any part of this authority may be delegated to base level from the MAJCOMs. The approval authority for MC work was increased to $200,000 in FY83 to increase flexibility. Construction work beyond this scope requires Headquarters Air Force or higher approval authority.

The rules on work classification and approval are clear cut. Nevertheless, we face continuing infractions of improper work classifications and approval levels resulting in project splitting and pyramiding. These violations are highligted in Inspector General and audit reports.

We must return to the basics. Know your work classification and subsequent approval authority. Insure all work has been classified and documented properly. Base commanders, in conjunction with base civil engineers, have the responsibility to insure that the public trust is not violated. (HQ AFESC/DEMG, Maj. Hains, AUTOVON 970-6387)

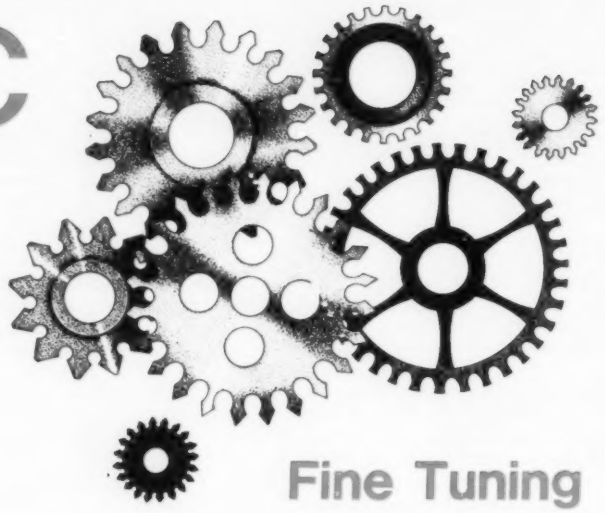
Materiel Control

Here are a few indicators to help you keep the BCE, and the chief of operations advised on "what's happening." These indicators will help you improve communications on how and what you are doing, and what help you need to improve materiel support:

- CE Issue Effectiveness, Bench Stock Due-Out Rate (M32/M24),
- Bench Stock Availability Rate (AF Form 1920),
- Material Response Times, Stratification of Completed Bills of Materials,
- Job Orders Awaiting Materials (See E&S **Quarterly**, Winter 1982-83),
- Backlog: Bills of Materials Awaiting Processing, RDD/EDD Exceeded,
- Residue Management (See E&S **Quarterly**, Fall 1982),
- Status of Backup Appliance Accounts, Status of Carpets,
- Results of Monthly Reconciliation and Planners Validation,
- GOCESS Inventory Turnover Rate, GOCESS Availability Rate,
- COCESS NPI and Priority Charges, MRL Analysis (adds, deletions, etc.),
- Analysis of Change Orders, Reorders, Missing Items,
- BUFIS, MFH U-FIX-IT, Self-Help Store,
- Results of Monthly Sample Inventory/Location Checks,
- GOCESS/COCESS Sales to Other Customers,
- Special Levels (dollar value, items not on-hand), and
- Dirty Dozen (12 oldest/problem items)

Be innovative! Capture trend data, set your own goals and encourage management and the "worker bees" to participate. Discuss what it will take to improve a trend. Be proud of your operation and the support it is providing to the squadron. Let everyone know about it. Why not send us some of the creative indicators that you are using so we can spread these good ideas around. Need help or further information? Give us a call. (Lt. Col. Munn, AUTOVON 970-6111)

HVAC



Fine Tuning

by Ed E. Wilson Jr., P.E.

In the ten years since the energy crisis, we have undergone three important phases of energy awareness and sensitivity. In the first phase, we were alarmed by shortages, increasing costs, and the impact on our lives — inconveniences on the one hand, and a higher cost to live and work on the other.

In the second phase, we began the process of adapting to higher cost, including analyzing what was costing us the most, and engineering the solutions — solutions that in some cases are taking years to implement. Almost unnoticed is a third phase — tuning up. It means getting the most out of the energy we buy, and making existing systems work better.

This fine tuning applies to our energy control systems in the home and the workplace. Before energy began costing such a significant share of our national budget, we could assume that the electronic and mechanical marvels controlling our air conditioning and heating processes "must be working," because we only recently heard it go on or off. In heating, ventilation and air conditioning (HVAC), assumptions are the paving stones to a long series of big and unnecessary bills. To get the most for our money, it takes not only functional checks, but also some expert fine tuning.

What is fine tuning? Basically, it's just getting a system to run as it was designed to run. Each component to the HVAC system is adjusted so that it properly interacts with the other components. This means not only the temperature in the space being controlled, but that it is being controlled efficiently, and that air quantities are correct and individually controlled devices (heating coils, cooling coils, outside air dampers, etc.) are not fighting each other to satisfy the space temperature. Obviously, defective components must also be replaced or repaired if the fine tuning effort is to be successful.

How do we fine tune our systems when all we can handle are the service calls? If we did not spend so much time responding to emergency calls, would we have more time to perform recurring maintenance, and not have to spend so much time responding to emergency calls? Fortunately, our problems don't all stem from a lack of manpower, but result from poor management emphasis on recurring maintenance.

In August 1982, the Air Force Institute of Technology (AFIT) made an effort to determine the level of knowledge possessed by our maintenance people, their abilities to understand sophisticated HVAC systems, the condition of our systems, and the effectiveness of our maintenance programs. Eighteen people, representing a cross section of our maintenance capabilities, were assembled at Wright-Patterson AFB, Ohio, for a week of examining and questioning. They were tested to determine their level of knowledge, further educated, and then tested again. The study, which concentrated on the controls aspect of HVAC, concluded that our maintenance people have inadequate technical training and knowledge, but do have the ability to work the problem effectively, given the opportunity to learn.

Some of the most interesting results came from a questionnaire about conditions at the participants' home bases. The majority of participants said:

"Engineering help was sometimes available and, at times, helpful."

"The Recurring Work Program (RWP) addressed only some of the tasks needed to be accomplished." (A rather large number, 28 percent, said that the RWP was usually signed off to free-up-hours for job/work orders.)

"The mechanical systems were in serious need of upgrade/overhaul."

"Much more emphasis should be placed on recurring maintenance."

"Management's primary emphasis was to do whatever had to be done to satisfy the customer rather than the RWP."

"We have most of the tools we need to do our job."

"We need much more training to do our job."

Also of interest was that no general consensus whether adequate numbers of personnel did or did not exist to follow aggressively a RWP. Because they had not performed recurring maintenance on control systems in the past, they did not know how many people it would take. About half believed they had enough manpower and half believed they did not.

We are missing a tremendous opportunity to reduce both our utility budget and service call burden. To illustrate the potential savings to be gained, we only have to look at the track record of Trans World Airlines. TWA embarked on a program to tune-up its systems in 1976. It turned out to be a get-well plan running three years, resulting in about a 60 percent energy savings. The emphasis was on getting systems to run as designed in lieu of expensive rehabilitation or replacement projects. Most work was associated with fine tuning of control systems and balancing air distribution systems.

Our problem is that, like industry, we have failed to recognize the need for periodic tune-up of control systems. A recent

article ("Theory Meets Practice In a Full-Scale Heating, Ventilating and Air Conditioning Laboratory," ***American Society of Heating, Refrigerating and Air Conditioning Engineers Journal,*** November 1982) showed alarming results of a testing effort concerning HVAC components performance. Factory calibrated thermostats demonstrated both inaccurate set point and gain, receiver/controllers drifted out of calibration in less than 72 hours, enthalpy economy cycle control logic devices demonstrated inaccurate performance, etc. How much does it cost us to have enthalpy economizer-controlled outside air dampers open when they shouldn't be, reheat coils open on variable air volume (VAV) terminal boxes when cooling is still required, air handling unit cooling and heating coils open at the same time, etc? A lot!!

So maybe we don't really care if we're wasting energy. It's more important to satisfy the customer and none of the previously described malfunctions may have resulted in a service call. However, allowed to go to the extreme, a service call most likely will eventually develop and could be expensive in both repair costs and downtime to the facility.

To illustrate, imagine the following scenario:

The outside air dampers for the main air handling unit serving the officers' club ballroom are in the wide open position. It's a February night at a northern tier base. The thermostat protecting the heating coils from freezing has been by-passed, and the local congressional representative is scheduled to speak the next morning. How fast can you replace the frozen, busted heating coils? Well, look at it this way. It's another opportunity to excel.

AFESC has taken several steps to correct deficiencies relative to HVAC recurring maintenance, but the only way to carry out an effective program is for the base level management to get involved. There is very little that higher headquarters can accomplish if senior management at base level chooses to ignore the problem. For this reason, we conceived of base HVAC evaluation groups, chaired by the deputy base civil engineer. To be successful, evaluation group meetings cannot just be fill-the-square exercises, but must concentrate on problem areas that impede the RWP, like scheduling, material control and training.

Besides beating the drums to bring attention to the problem, the Air Force has taken many positive steps toward a "get-well" plan.

On the design side, we needed better documentation of our control systems. To fine tune these systems properly, our technicians need to have accurate control drawings, including all parameters such as throttling range, proportional band, etc. To alleviate this deficiency, Headquarters USAF/LEEE issued Engineering Technical Letter 83-1 Feb. 16 and will include these design requirements in the next revision of AFM 88-15.

Unfortunately, as the AFIT study pointed out, many of our maintenance people cannot accurately interpret drawings, draw conclusions and make adjustments. (See "HVAC Controls Maintainability: The Concept," this issue.) To alleviate this problem, the Civil Engineering Training Group at Sheppard AFB, Texas, is revising the basic controls course and is developing an advanced HVAC controls course to provide more training on system operation and overall system performance. To speed up training efforts, AFESC has published information on privately-operated HVAC control courses, including information on how to obtain appropriate approvals and funding. We are also beginning development of a self-study guide on HVAC controls. Finally, our Civil Engineering Maintenance Inspection Repair and Training teams stand ready to provide "hands-on" training to base personnel.

In regard to policies and procedures, AFM 85-18 is being rewritten now. The new manual will require development of maintenance action sheets for HVAC control systems as a distinct work load.

We have more potential for immediate returns in this area than any other program being worked. A conservative estimate of savings is about $130 million per year. Beyond that, the intangible benefit of maintaining comfortable, satisfied "customers" should provide sufficient incentive in itself.

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IMAGE

The civil engineering portion of the Air Force functional review program has been designated as Project IMAGE. The acronym means, "Innovative Management Achieves Greater Effectiveness."

The first product from Project IMAGE is a new mission statement for civil engineering, recently approved by Maj. Gen. Clifton D. Wright Jr., director of Engineering and Services. The statement reads:

The mission of Air Force civil engineering is to provide the necessary assets and skilled personnel to prepare and sustain global installations as stationary platforms for the projection of aerospace power in peace and war.

The main thrust of Project IMAGE is to analyze the base civil engineering (BCE) organization in terms of products and services provided. The identified product areas are:

- Ensure Readiness
- Provide Real Property
- Sustain Real Property
- Provide Utility Service
- Establish Physical Environment
- Provide Fire Protection
- Provide Non-real Property Service
- Provide Technical and Management Services

The implementation of flexible procedures allowing for innovative management at the BCE level is a major goal. Removal of constraints to BCE productivity is receiving high emphasis.

A workshop on BCE Fire Protection was recently completed. During the next year the following workshops are tentatively scheduled:

- Engineering
- Planning
- Administration
- Financial Management
- Management and Supervision

CAPT. BRAVO, (HQ AFESC/DEMG, AUTOVON 970-6388)

HVAC Controls Maintainability: THE CONCEPT

by Capt. Tom Kenna and Maj. Bob Schultz

- **"If it's easy to maintain, it will be maintained. If it's not, it won't."**
- **"If you need a ladder to check it, it's a bad design."**

These concepts are valid. However, the standard way that we do our business in heating, ventilating and air conditioning (HVAC) controls yields systems which are extremely difficult to maintain. This results in woefully excessive HVAC energy consumption, and poor service to our customers, many of whom require precise, reliable environmental control to perform their mission.

What can we do to improve this situation?

The Status Quo

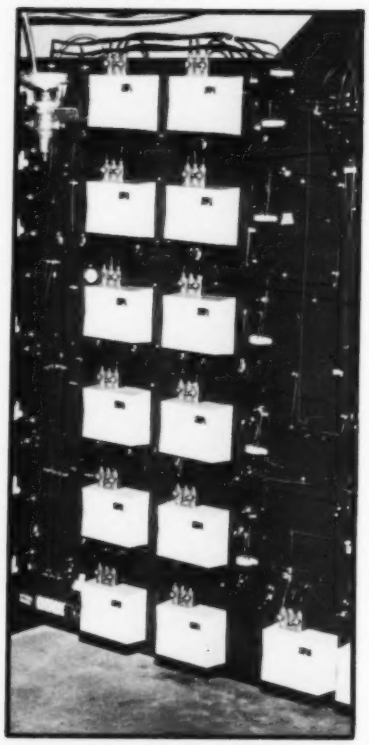
Our design engineers and the engineers who work for our architect and engineering firms long ago adopted a standard policy of writing a control specification which merely states the conditions to be maintained by a particular HVAC system. It is then up to the contractor to design and submit a system that meets the specificed performance. Either we or our AEs generally accept the contractor's submittal in good faith, usually because we do not have the expertise necessary to do otherwise. Besides, the contractor is still responsible to make the system work. Right? Maybe. Let's step back for a minute and see what kind of control system this state of affairs ***really*** results in.

Put yourself in the position of the control manufacturer or the contractor and some interesting problems with the performance specification concept come to light. The controls contractor must interpret what we want from our statement (which is frequently not clear), layout a system which we want, price it out at a level which (a) makes a profit, (b) is competitive and (c) can maintain elements (a) and (b) even if we are not satisfied. The contractor also has to modify the original design so we get the performance we need.

The net effect is driven by simple economics: The controls contractor must minimize costs to maintain a profit margin in an uncertain environment. Consequently, HVAC components will be located in a facility in a way to minimize installation costs. For example, we have consulted on a control system where technical personnel responsible for maintaining a 200-ton variable air volume system for six years — since the building was new — could not find major control components to determine its status. Temperature controllers on the same system were located above ceilings over occupied spaces. These controllers, therefore, never had been checked for proper operation.

Another avenue open to the controls contractor to maximize profit is to use "specialty" equipment. "Specialty" hardware may combine several functions under one cover, frequently giving the device an "energy-saving" name or description. This situation is especially true in the electronic control arena where the manufacturers have developed packaged systems for specific applications. It sounds good on the surface, but is a nightmare for the technician. Specialty equipment is very difficult to trouble-shoot. One manufacturer's single-zone control package has 32 terminals (wire hookups) and it is extremely difficult to analyze separately the performance of its several control functions. The same performance can almost always be obtained with standard hardware with which our technicians are familiar. But, we have to be smart enough to know what to ask for and then to determine whether or not it has been provided.

HVAC control panel



This consideration leads to probably the most damaging aspect of the way we presently do business: Control system documentation. The control submittals and as-built drawings now being received from the controls contractors are typically installation oriented, and the components referred to on the drawings are generally identified by manufacturers' part numbers. These drawings are frequently drawn so compactly the entire control schematic and elementary (ladder) diagram — if we get one — are all on one sheet. At the submittal stage, this situation makes the review process quite challenging because considerable research is required on the part of the government engineer to determine just exactly what "brand X model 3005" does in the proposed system.

Another problem is that the submittal frequently does not establish ***all*** adjustment values for each component that has an adjustment. As stated, at this stage the engineer usually winds up accepting the submittal on good faith. (Ultimately, it ***has*** to work. Right?)

Unfortunately for the technician, the controls contractor has now been put in the driver's seat. The system ***has*** to work for the contractor to get paid, but does it have to be easy to maintain? Not really. As a matter of fact, that same documentation used at the submittal/installation phase is frequently accepted as the as-built control system documentation, with nary a set-point, throttling or spring range stated anywhere. Some of this information may be buried in a component number, but technicians cannot carry with them on the job a full-line product catalog for every manufacturer. The point is, our present system of buying HVAC control systems is inherently self-defeating. A newly acquired system may be indeed fully operational when we accept it. But it may also be so difficult to maintain that it will be essentially sabotaged the first time it requires service. Any degree of energy efficiency or effective control will be lost.

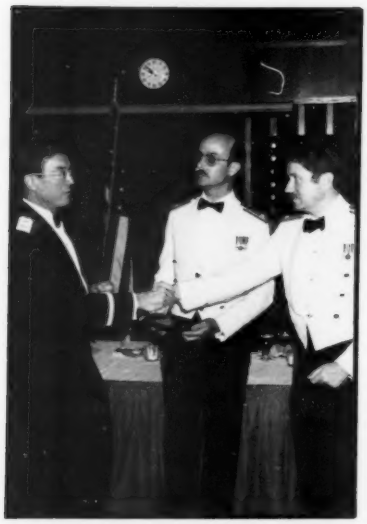
Golden Opportunity

In a research program conducted at the School of Civil Engineering, concerning the operation and maintenance of Air Force

HVAC systems, 18 technicians from across the Air Force were tested to determine their system trouble-shooting ability. Additionally, this program also sampled their opinions concerning the quality of control system documentation at their bases, the controls problem engineering (DEE) assistance they could expect, and the quality of the preventive maintenance program at their base. Technician abilities to trouble-shoot sophisticated control systems were greatly enhanced when given adequate documentation, especially for a system which was designed to be maintained ***from the outset***.

Basically, the technicians in the study group received some systems-level training for two and a half days on single-zone systems and then were tasked to fine-tune a four-zone multizone system equipped with maintainability features. Simply put, they had no problem, and the system as they left it could not have operated any more efficiently or effectively. Maintainable designs, combined with adequate training and management emphasis, can significantly contribute to the efficiency of our HVAC systems. The Air Force Engineering and Services Center has estimated that the energy cost avoidance attributable to getting well in this area is at least $130 million per year.

Maj. Gen. Clifton D. Wright, Jr., (left), Director of Engineering and Services, HQ USAF, presents the Technological Innovation Award to Maj. Robert Schultz (center) and Capt. Thomas Kenna. They were honored for their School of Engineering faculty work involving the application of new technology to maintenance, repair and operation of mechanical facility systems in more energy efficient ways.



Maintainable Designs

Just like reliability or energy efficiency, maintainability must incorporate specific features in both the location and manner in which components are installed, and the way in which the layout and operation of the system is documented. Those two key criteria are strongly featured in HQ AF Engineering Technical Letter 83-1: Design of Control Systems for Heating, Ventilating and Air Conditioning Systems (HVAC), Feb. 16, 1983. The letter calls for specific design features in all HVAC control systems. These features are intended to enhance the efficient and effective operation of our HVAC systems by making them easier to maintain. Some of these ideas are:

a. Use of remote sensors so controllers can be centrally located in the mechanical room.

b. Logical grouping of controllers, adapters, relays, and power supplies in an easily accessible controls cabinet mounted away from vibrating machinery.

c. Use of functionally standard control components which are basically single-function devices. Adoption of this idea simplifies trouble-shooting, reduces supply problems while maintaining a competitive bidding capacity, and still provides a control system sophisticated enough to meet the most demanding requirements.

d. Inclusion of pneumatic test ports and electronic-system terminal strips cross-referenced to the documentation to facilitate trouble-shooting and calibration.

On the documentation side, the maintainable design must present the following on the drawings:

a. A fully labeled control schematic which details all set-points, throttling ranges, actions, spans, proportional bands, and any other adjustments.

b. A fully labeled elementary (ladder) diagram.

c. A sequence-of-control statement cross-referenced to the control schematic and elementary diagram.

d. A generic, functional description of each control component.

e. A detail of the control panel (noted above) showing dimensions, color and component layout.

f. Legends and performance schedules designed to clarify the operation of the system.

The capabilities afforded by such design and documentation are truly impressive. For example, the HVAC control panel depicted is a sample of a pneumatic controls system built according to this design philosophy. While not 100 percent complete in this photograph, the authors have already made excellent use of its designed-in maintainability features. During the checkout before final acceptance of this 10-zone multi-zone system with humidity control, we were able to use the test ports and documentation to completely check out a system which a major controls manufacturer said was ready to be turned over to the government. During our checkout, we found that a relay which was essential to the economizer (i.e., "free cooling") was inoperative and never would have delivered the energy sufficiency it was designed to achieve. Additionally, five other components were found to be improperly calibrated. These items, along with improper operation of the steam grid humidifier are now all punch list items for the contractor to correct. Had the maintainability features not been there, the government would have bought the system as installed and our technicians ultimately would inherit the problems, especially if they were not caught during the warranty period. Loss of the energy-efficient "free-cooling" feature with outside air might never have been discovered.

Bottom Line

Quality documentation coupled with an inherently maintainable design yields a HVAC system that has a high probability of meeting the customer's needs and minimizing expenditures throughout a system's economic life. Hands-on experience here at AFIT, both in our technician-research program and in personal consulting by the authors, unquestionably supports the need for inclusion of these concepts in all new and retrofit work. Designing for maintainability, quality documentation and improved technical training (which is already being developed) will permit the establishment of effective preventive maintenance and energy conservation programs.

Maj. Bob Schultz is Chief, Mechanical Branch, 3770th Technical Training Group, Sheppard AFB, Tex. He earned his bachelor of science degree in Mechanical Engineering from the University of Arizona in 1970. He is a registered Professional Engineer in Ohio.

Capt. Tom Kenna is a mechanical engineer assigned to AFIT/DE. He received his bachelor of science degree in Mechanical Engineering from Tulane University in 1972 and his master of science in Facilities Management from AFIT in 1977. He is a registered Professional Engineer in Ohio.

Energy Savings via EMCS Level A vs Level C

by Edward Ling, PE

EDITOR'S NOTE: This article shows the savings achieved by the USAF Accounting and Finance Center, Lowry AFB, Colo., in the process of converting from level "A" energy management and control to the more sophisticated level "C" with its more finite controls and logic, and built-in maintainability features. The author wishes to point out that the energy savings draw almost entirely from level "B" while the improvements in maintainability and fault identification result from level "C."

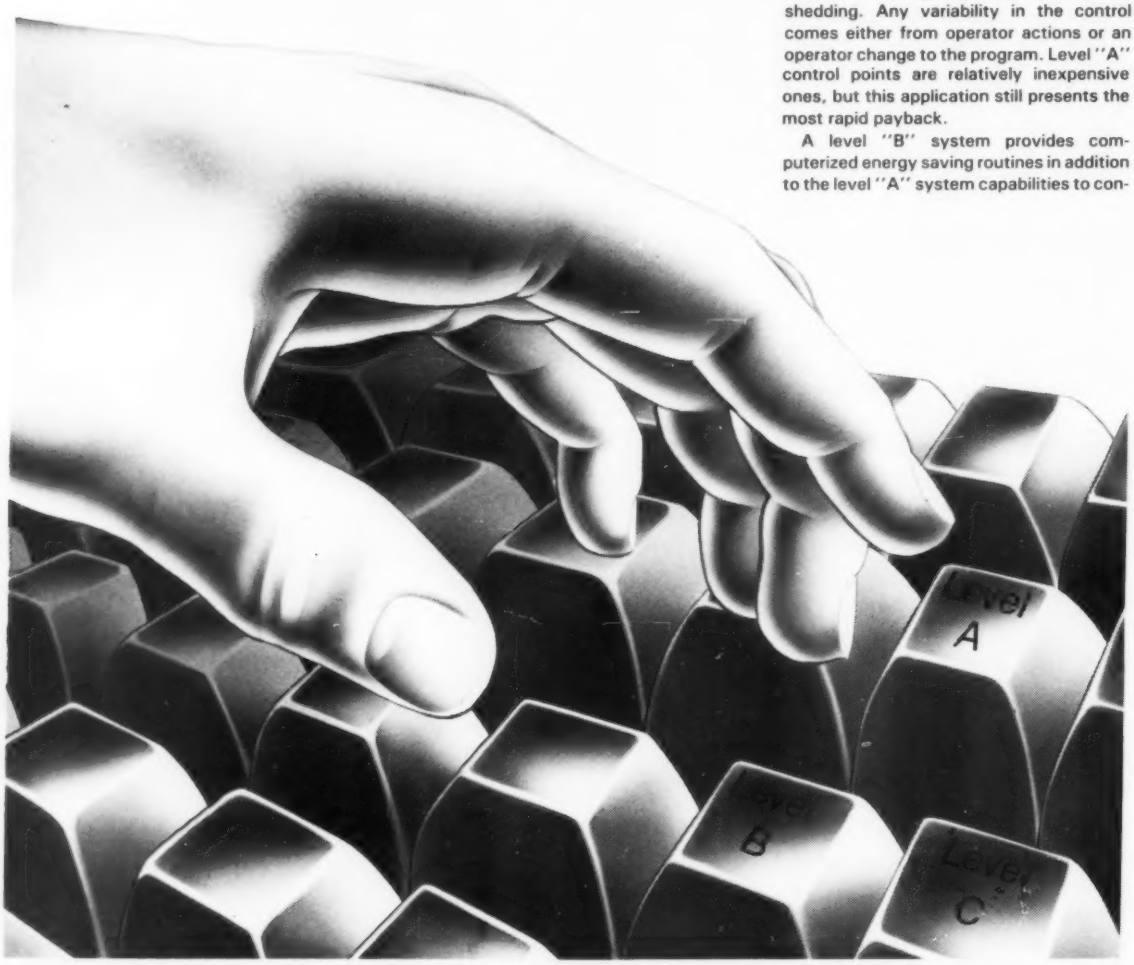
The Accounting and Finance Center at Lowry AFB, Colo., was constructed in 1974-76 at a cost of around $20 million. Billions of dollars worth of Air Force funds are channeled through computers in this building. Air Force Reserve personnel records are kept there. More than 3,000 people work in the building. It is a three-story unit about 600'x300', containing 617,000 sq. feet of floor space. The top two floors are mostly window wall construction while the lower floor is mostly below grade. About 25 percent of the lower floor is dedicated to computer processing.

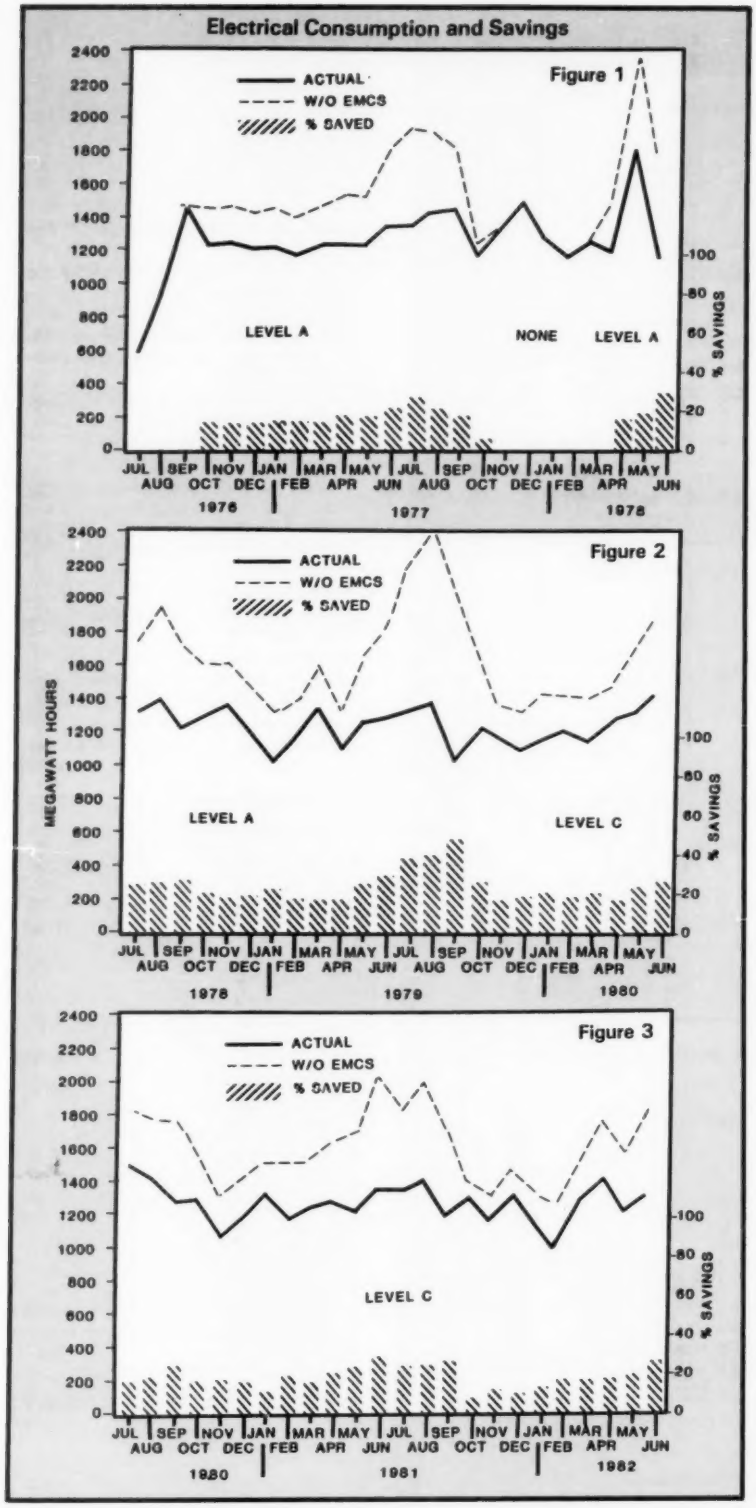
As part of the original construction of this facility, a level "A" energy management and control system (EMCS) was installed. About one year after completion, an allegation was made that boiler problems were being caused by the actions of the EMCS. To resolve this dispute, the EMCS was shut down for five months (November 1977 thru March 1978). This "down" period provided a baseline for future evaluation of EMCS savings. In November 1979 a level "C" EMCS upgrade was completed and placed on-line. This series of events provided some interesting field data for comparison: A baseline period without EMCS but after EMCS was operational, two separate periods of more than a year each with a level "A" EMCS and then three consecutive years of operation with a level "C" EMCS.

Defining Levels A, B and C

A level "A" system provides start/stop control of equipment, either by the operator or by a program in the central control unit (CCU). This level can provide unoccupied shutoff, duty cycling and demand load shedding. Any variability in the control comes either from operator actions or an operator change to the program. Level "A" control points are relatively inexpensive ones, but this application still presents the most rapid payback.

A level "B" system provides computerized energy saving routines in addition to the level "A" system capabilities to con-





serve energy. Some of the more common computer programs which are added by the level "B" system are:

a. Unoccupied shut-off with optimized start

b. Enthalpy optimization (outside air economizer)

c. Supply air reset (on multi-zone, double duct and terminal reheat systems)

d. Temperature constrained duty cycling

e. Programmed night set-back/set-up (programmed control point adjustment, or CPA)

f. Remote space temperature control from the console

g. Chiller optimization

A level "C" system uses the full capability of the third and current generation of EMCS. In addition to saving energy, level "C" provides a significant maintenance management capability. The console operator can troubleshoot HVAC and various other utility systems from the console. High-pressure natural gas and oil-fired boilers can be monitored and controlled from the console rather than by full-time plant operators. Water storage and distribution systems can be operated from the console. Sewage treatment plant operations can be monitored sufficiently to preclude full-time plant operators on night shifts. Electrical equipment in substations can be operated remotely, thus improving reaction time in emergencies or outages. When two substations can be balanced and backfed to level the demand peaks, that operation can be controlled at the console. Maintenance tasks can be based on computer-tracked equipment run times.

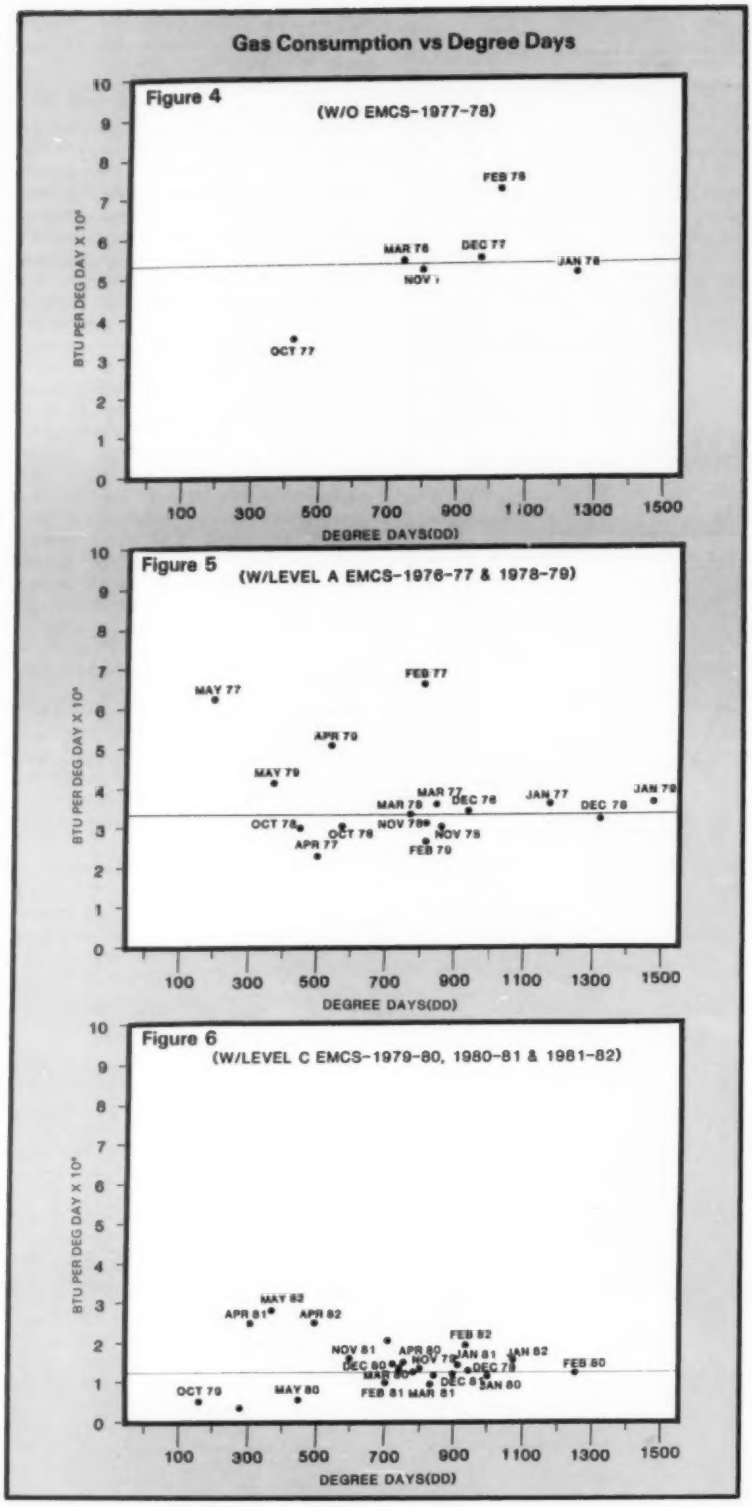
Plotting Energy Consumption

The solid curves in Figures 1, 2 and 3 represent the actual electrical consumption in the finance center. The dashed curves represent the projected consumption without EMCS. The bar graphs at the bottom reflect the actual percentage of electrical consumption saved.

The electrical savings indicated are based on the reduced motor run time within comfort A/C systems of air handling unit motors, pumps and chillers. Without EMCS, all these units ran continuously. The energy consumption rate of motors driving the air handling units and pumps was based on measured data from the system balancing report. Some estimates of consumption rates were made for the chillers, taking into consideration the unoccupied status and outside conditions (nights) when the chillers were kept off by the EMCS.

These savings computed to 20 percent with a level "A" system and 25 percent with level "C."

We can now establish a correlation between heating degree days and fuel consumption. The building is heated by two gas-fired hot water boilers. These boilers are shut off during the non-heating season. Steam for cooking and humidification pro-



cess loads is provided by a gas-fired steam boiler. These three boilers are the only gas consuming devices in the building. The average gas consumption during the three summer months was deducted from the winter consumption to determine the figure for heating. Figure 4 is a plotting of the heating fuel consumed (in BTU x 10^6 per degree day) on the vertical axis against the degree days for each month (October 1977 through March 1978) when EMCS was non-operational.

Figure 5 is a similar plotting of the fuel consumption for the winters of '76-77 and '78-79 during which the level "A" EMCS was operational. If months with less than 300 degree days are ignored, the results are very consistent.

Figure 6 is a plotting of the fuel consumption for the winters of '79-82, during which a level "C" EMCS was operational.

One of the major contributions to the increased savings with the level "C" system was some wiring changes which allowed the computer — via the supply air reset program — to directly control the mixed air temperature.

Again, the consistent relationship exists between fuel consumption and heating degree days.

Once the consistency is recognized, the three plots can be combined on one graph (Figure 7) to reflect the savings visually. The baseline fuel consumption is 5.3 BTU x 10^6/degree day. With a level "A" system,

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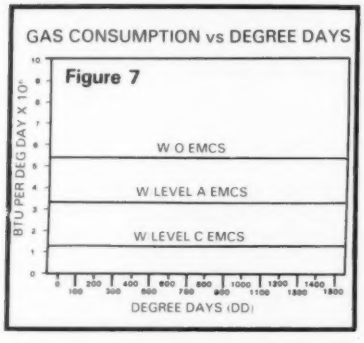
the consumption dropped to 3.2 BTU x 10^6/degree day, a reduction of about 40 percent. The level "C" system resulted in a consumption of 1.2 BTU x 10^6/degree day, or an added 19 percent reduction from the original baseline. These numbers are shown on the next graphs. Based on total consumption over the six years, the level "A" system reduced energy consumption by 32 percent while the level "C" system reduced consumption by 68 percent.

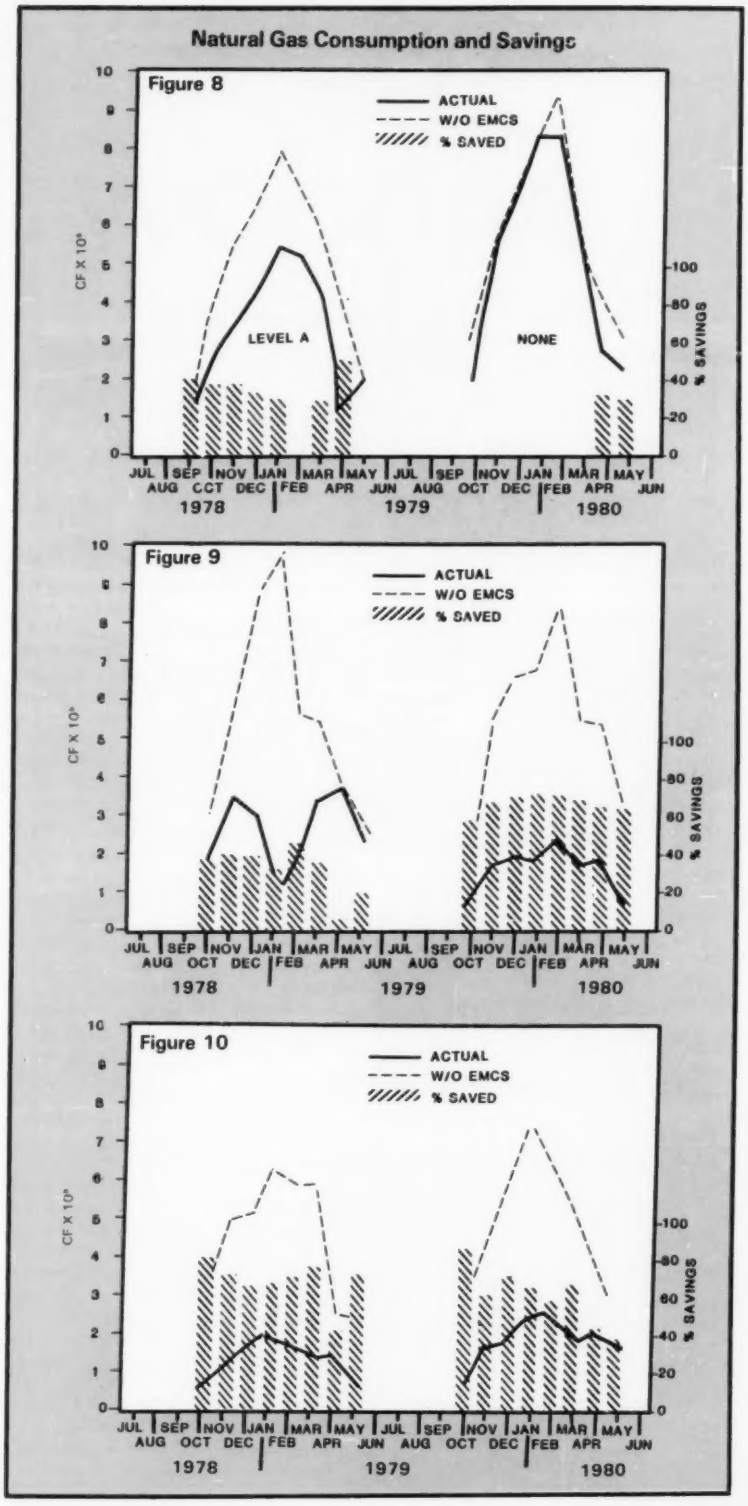
Figures 8, 9 and 10 are plots of actual heating fuel consumption along with projected fuel consumption without EMCS. The lower bar graph reflects the savings due to EMCS as a percent of the consumption without EMCS.

This is not to say such dramatic savings approaching this could be expected on any specific facility, but these are the results measured at the finance center.

The total expenditure for EMCS in the center today totals slightly less than $1 million. The savings since installation through FY82 total about $1 million or around a six-year payback. It is obvious the payback would have been faster had the level "C" system been installed at inception rather than two years later.

The savings indicated for this building reinforce belief in a level "C" application of EMCS. This is the concept Air Training Command has followed for the last eight years.





the window place

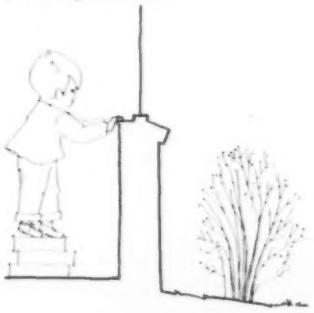
A research project to evaluate the impact of architectural design on the occupancy use of space

by Capt. Stanley M. Bell (USAFR)

Once there were some very little children who were hurrying toward a window to see a squirrel who was hiding acorns in a tree Quickly they dragged chairs and boxes to the wall to get high enough to see out the window and watch the squirrel hide away his food for the winter. In a few moments the squirrel had hidden the acorns and scampered away and almost reluctantly the children turned from the outside entertainment, climbed down from their boxes and chairs, and went back to their indoor play in the Child Care Center.

The uniqueness of this event is that these little children could not spontaneously react to seeing a squirrel outside; a "grown-up" had to first call it to their attention. The building did not ***encourage,*** and only in an awkward way ***allowed*** the event to happen as indicated in Figure 1. This is a common problem in utilitarian buildings which typify Air Force architecture where design emphasis in such buildings was given to cost and function. Today these same criteria are important but with an additional requirement to improve the quality of the environment – liveability.

Figure 1:
Existing Window



Liveability is that quality in a building which allows meaningful ***patterns of events*** to happen and encourages them to keep on happening, creating a vitality in the built environment, even a timeless quality. The term "patterns of events" includes more than human events; it also includes the sun shining on the windowsill, a gentle breeze through an open window, or the sound of rain outside the window.

Design

The liveability of a building is established by the events that happen there and the outward shape of the building should allow and encourage many patterns of events to occur. To demonstrate the relationship between liveability and "patterns of events," examine a research project conducted at the Grissom AFB, Ind., Child Care Center.

The purpose of the project was to evaluate the impact of architectural design on the occupancy use of space. The opportunity for this study arose when the base civil engineer's staff began designing an addition to the existing Child Care Center building.

I remembered the squirrel event and suggested a design for the windows that would allow a more direct contact between interior and exterior space, creating a window with a sense of place in which the building provides a sense of shelter from the elements and less that of a container. The center director and the project engineer were anxious to use the design in the addition. Seeing their enthusiasm, I suggested that one of the windows in the existing building could be replaced with a new window design – one that would allow more child contact with the outside as illustrated in Figure 2. With these ideas in mind this seemed a good opportunity to study the influence of architectural design on occupancy behavior. This would make it possible to monitor occupancy use of the existing activity room and again monitor its use with the new window to determine if the use of space would change in a measurable way.

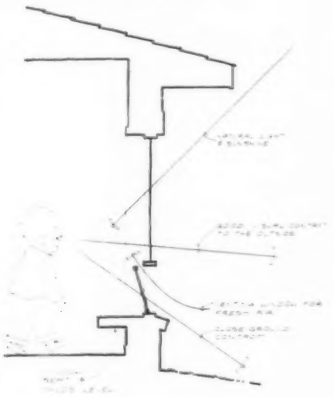
Monitoring the Change

Dr. Neville Clouten and I worked on monitoring this space using a radio remote photographic time sampling methodology. (Dr. Clouten is chairman of the department of Architecture at Andrews University, Berrien Springs, Mich.) This is not as complex as it may sound. The radio remote control allowed us to objectively record occupancy use. Objectivity is necessary if the findings are to reveal typical occupancy use of the activity room. The stereoscopic photography simply provides the most accurate method of recording occupancy use. To insure this objective recording, a grey metal box holding the photographic equipment was positioned on the wall near the ceiling for a week before the first recording took place. (Figure 3)

Before the window change, monitoring was conducted over three typical and consecutive days. This allowed us to determine the existing occupancy use patterns in the room. Throughout each day the radio remote unit triggered photographs at random intervals. The only contact with equipment was daily loading new film and checking equipment and power prior to the arrival of the children.

After the window change, a year later, monitoring was again conducted over three typical and consecutive days using the same location for camera position. The only change in the area being studied was the new window.

Figure 2:
New window design



Results

Before the window was changed, the first monitoring session indicated that the window had negligible influence on the children using the space. None of the stereoscopic photographs indicated that the outside environment was in any way a part of the activity room world. The existing window simply appears to be a hole in the wall that is there just to admit light. A sample stereopair (Figure 4) supports this observation.

After the window was changed, the second monitoring session indicated the dramatic influence of the "window place" on children using the space. A total of 94 stereopairs were taken during this session and 49 pairs (or 52 percent) included activities on or near the window seat. Two stereopairs that well illustrated the children's response to the new window (which has now become a "window place") is shown in Figure 5.

On completion of the second recording session, teachers were questioned on the effects of the new window and the children's behavior. It was their opinion that the children now used more of the available space in the room for play activities. Whereas children had previously run back and forth along the length of the room, they would now stop at the "window place" — now described as the "quiet area," a "special area" and a "first place to gather on arrival." Teachers liked the oak seat and agreed that it was at the right height. There was a different attitude in child users as well as an interest in squirrels — even suggestions for adding bird feeders in the adjacent outside area.

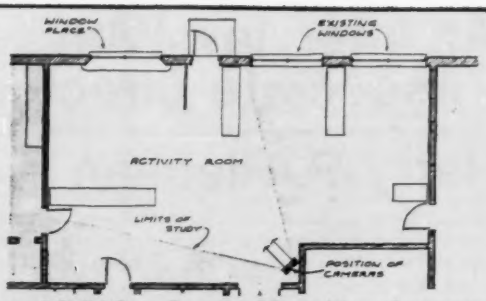
Conclusion

The results of this study are:

- The idea of monitoring change to test ideas is important and must become a part of the design process if new, or even old ideas, are to be used in building new or in altering buildings;
- Buildings should be designed to allow and encourage meaningful patterns of events to happen and keep on happening.

Clearly the evidence is persuasive that the new "window place" in the Child Care Center has improved the liveability of the activity room for the children. The quality of the built environment has been uplifted by simply considering seriously the patterns of events that children would appreciate in just a window.

Figure 3:



Partial plan of Child Care Center with position of cameras shown.

Figure 4: Before the window change

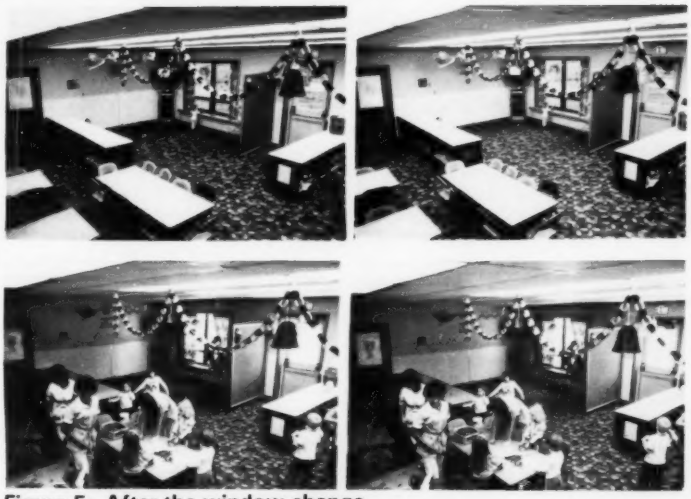


Figure 5: After the window change

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An Interview With The Associate Director

Harry P. Rietman

by H. Perry Sullivan Jr.

EDITOR'S NOTE: Harry P. Rietman, senior civilian in Air Force Engineering and Services, was interviewed in his office at the Pentagon in Washington. He has served every Director since 1955. Said a longtime associate: "If you look carefully, you will find that Harry Rietman has an influence, an involvement, a role in every major program in Engineering and Services that succeeds. He is an omnipresent benefactor. Yet, he has never placed himself in the position of forcing any project to go through him. However, any project that does not is missing a quiet force, a gentle guidance, a sense of the time and place for the project to take wings."

ESQ: You've been identified over the years with the programming side of Engineering and Services. What are the changes you perceive in the programming process?

Mr. Rietman: Although there's a tendency in programming to believe you're doing the same thing year after year, that's never really been the case, because of all the different attitudes of the review agencies we deal with. There have been major changes in the way DoD approaches programming. When former Secretary of Defense (Robert) MacNamara came on board we had the first really drastic change in the way the Air Force put its programs together and how they were justified to meet DoD requirements. It was the first formal attempt made to compartmentalize and justify the program as a whole entity rather than bits and pieces. That development has continued. Each new Defense Secretary has imposed a different style of program support. Concurrently within the services we've developed different techniques of finding the best way to depict what our needs are to the people in higher levels. The evolution has been the most interesting aspect of it. Programming is not stereotyped and it's not overly repetitious. We've had dormitories in every program that's ever gone to Congress. But, there have been different approaches and different packaging techniques that have been used to enhance our ability to get dormitories approved.

ESQ: We have an awful lot of civilians who have tremendous seniority, tremendous experience. Many are getting closer to the point of retirement. At the professional entry level of Engineering and Services, do you advocate the development of programs to bring on young civilians as engineers and managers looking to the future of the civilian continuity force?

Mr. Rietman: Sure. A very obvious answer is that it's normally the way we can keep a vital work force and be responsive to the needs that are going to be placed on us. There has to be a constant renewal and not necessarily a renewal by age but a renewal of outlook. Whether that takes "new blood" or the people on board there's a continuing need to bring people along in the area of career development. There has to be that continued infusion of renewal and there has to be a desire on the part of the people who start at our base level to progress through the civil engineering and services structure. We need to gain the benefit of the knowledge that people have acquired at bases and major commands and bring it into this headquarters. I've said many times that the mission of the Air Force is accomplished at the bases, not in the Pentagon. We've got to get the resources to our bases, or we're not doing our job.

ESQ: What would you suggest to the civilian management component of Engineering and Services as keys to success in the complex environment in which our people must function?

Mr. Rietman: I think the simplest thing for them to do is make sure they know who is their boss. Then make sure they're working for him or her. I could get into a lot of complicated formulas, techniques and exotic sounding words but it probably comes down to something that simple. People can't work for more than one person at a time. If they have a clear idea of who they work for, and what they're supposed to accomplish, they'll get there much quicker.

ESQ: You've been identified with the Engineering and Service Civilian Career Management Program from two aspects — first as a senior civilian in Engineering and Services and secondly because of your active interest and participation in its development. How do you feel about the overall progress of the ESCCMP?

Mr. Rietman: Our civilian career development program has come along beautifully. I think a great deal of the credit for that goes to the man who heads it, Chuck Johnson. The efforts that he's put forth have gotten us quickly to the point of the program being effective. We've made our first referrals from the central program against vacancies. That part of the program will gradually increase as more and more of our positions are centrally managed and the referrals are handled out of San Antonio. But, the real purpose of that program is not the referral portion of it, although that's the one that gets the most publicity. It's the training and development of our people. Central funding of our training will certainly put us in a much better position to ensure career oriented people will have opportunities to get additional education and broadening that will qualify them to advance; either to more responsible positions on the base where they are now, or elsewhere in the Air Force. That is probably one of the biggest changes I've seen in the time I've worked for Engineering and Services. It's not going to make it easier for people to progress any more rapidly. It's going to make it clearer what the system expects if they are to progress. Nobody is going to lead an individual by the hand from place to place. But it will be spelled out in a very clear pattern of things that will be advantageous to accomplish in order to progress. It's not that we're going to centrally manage people's careers. We're going to centrally manage career patterns and identify opportunities. It's still going to be very, very incumbent on the individual to make sure they have the training and experience, and that they've made themselves available to fit those patterns that fit their objective.

ESQ: Do you see a pattern that is desirable in career development, particularly in such positions as deputy base civil engineer?

Mr. Rietman: It's hard to say there should be a rigid, fixed pattern that would lead to any particular job Air Force wide. There are certainly some areas of experience or accomplishments that probably should be common to anybody's background who wants to aspire to those positions. I think because of the diverse nature of the work, there's not an absolute standard or norm that you can give someone and say, "This is the only thing; these are the only characteristics of an individual who would be a deputy base engineer or a chief engineer." There are certainly career mileposts that we can establish that would say "These are basics," but there'll be a lot of filling-in between that each individual would want to do that would better suit them for these positions.

ESQ: What are we doing to provide better opportunities for our civilian force in terms of the opportunity to go out and make a meaningful advance in their educational background?

Mr. Rietman: The career program is probably the only thing of a central nature. There will still be the training funds that are administered by the bases and by the commands. There must be self-identification and the establishment of individual development plans and identification of training needs. There must then be a very concerted effort to be sure a person's needs are known to both his base training officer and the central program. It's still a program that's going to put the main burden on the individual to self-identify and to attend various training programs. The central management will open the door but the candidates will have to walk through it themselves.

ESQ: Will the professional military education and training opportunities improve for our civilians in ESCCMP?

Mr. Rietman: The establishment of the ESCCMP hasn't increased, by one dollar, the amount of money that's available in the Air Force for training. Nor has it increased the number of slots that are available. What we're saying is that we now have a better, more organized method of making our peoples' needs known and competing for those slots on a more timely basis. There'll be more publicity on, and more awareness of what training is available, what has to be done to apply and how to get qualifications considered. We haven't increased the opportunities, but we now have a better way to get at them. Up to this point it's been up to the individual. I know of several people who have had excellent development programs and have gone to many of the courses largely because they beat the bushes to find out when they had to apply and what was open, and did all the spade and leg work to get themselves into a position where they were a candidate. The people who could not do this, and many times they're in locations that make finding information very difficult, are at a distinct disadvantage. I would say those are the people who would be helped most by the career program. We hope to give them the career information they need. We won't be able to tell for a while whether that succeeds or not, but that is certainly one of the objectives.

ESQ: What's been your feedback from the field on the acceptance of the program, first from the viewpoint of the people who are in the target involvement group and secondly from the viewpoint of the managers who call upon the program for eligibles?

Mr. Rietman: In spite of the excellent effort made by the ESCCMP team to make publicity visits, it was impossible to talk with everyone who was a candidate. About 60 percent of the eligibles have signed up in the program. That's a very good figure. It's comparable to the amount of people who signed up in the other career management programs at this point in their program development. However, I was not satisfied with that number and we've taken actions to make sure that people who did not join have all the information on the program. Our objective is not to get 100 percent participation. We know there are good reasons individuals might not want to participate. But, as we've said in some correspondence going out, I just want to be sure that people who have elected not to participate are making a well-informed judgement. I feel participation should probably be around the

80-90 percent level, and that's the target. We have to make sure our people are informed. There is an effort underway now to contact, individually, everyone who has not joined yet and make sure, that they do understand the program and have had an opportunity to reconsider. As far as feedback from managers, it's been positive, but the sample is too small to draw conclusions.

ESQ: As I understand it from the ESCCMP program managers, there is no penalty of any kind for enrollment, and that enrollment — on the other hand — really increases opportunities.

Mr. Rietman: That's absolutely true. I've looked at it carefully and I can't see any disadvantage for joining the career program. There's a misunderstanding that the program involves a commitment to mobility. While that is certainly a feature, there is no reason an individual cannot join the program and restrict availability for career development to where they live now, or something very close to it. The serious issue is that the positions which are centrally controlled can only be filled by people who are in the program. Therefore, any centrally controlled vacancy that opens on a base can only be filled by people in the program. If there is someone on that base who aspires to a higher position right there in their own backyard, and that position is centrally controlled, they must be a member of the program in order to be considered for it or they will never be referred. Now that's a strong way to put it, but that's about what we said in the letter that we sent out to the commands asking for individual contact. My personal view is that if there is someone who, for whatever good reasons they may have, is absolutely satisfied with the job they're in, who never has any reason to believe that they'd want to progress to another job or to another location, then certainly there's no reason they would even take the time (about 10 minutes) to fill out the form. This holds true if someone has plans to quit or retire. That's why we're not shooting for 100 percent. For anyone else who's in Engineering and Services at this point, it seems like there are all benefits and no drawbacks to being a member. From a management side, it's probably too early to tell. We've only had about 50 or so referrals under the program and I would not want to draw any conclusions from that. I'm very encouraged with the quality of the people on the "certs" that have been referred and with the geographic diversity of the candidates. The logical candidates on the base also appear on the list with the qualified candidates from other locations. This will give the manager filling a position a wider range of qualified candidates than under the old system.

ESQ: Professionalism is the key to General Wright's program. This has many unique aspects among civilians, particularly if professional status or registration is to be pursued with a sense of urgency and purpose. Should civilians involve themselves in professional certification, and is there a major benefit in the civilian service to professional registration?

Mr. Rietman: Registration is the hallmark of the engineering profession in the same way as being accepted to the bar is in law, or as passing medical boards is in medicine. In addition to the degrees that are awarded by the colleges for achieving academic excellence, each one of those professions has an independent recognition that acknowledges the professional capabilities the individual has attained. And, for that reason, I would say anyone who is in a professional engineering position and does not attempt to become registered just doesn't understand what the profession is all about. While it is not a mandatory requirement for most of our positions, it certainly is an extremely desirable one. For an engineer who represents the Air Force in dealing both with his contemporaries and with other people on the base as well as the outside community, registration is just that second leg up that shows we are a professional force well qualified to undertake the work we do. I think it's an extremely desirable thing for anyone who is in a discipline that can be registered to do so.

ESQ: Among the engineering professions, there's been a new and sometimes painful awareness of increasing vulnerability to damages, and a new liability resulting from suits. Generally, do you see an increase in the costs that A&E firms will try to submit to us as a result of their higher risk insurance? And secondly, do you perceive the need for Air Force engineers, both military and civilian, to become actively involved through their professional affiliations in containing the problem?

Mr. Rietman: Before our discussions today, I talked with a representative from an A&E firm, and he volunteered some information. He is really concerned. We were discussing the bridge collapse in Connecticut. Court decisions have established there is no statute of limitations on professional responsibilities for design or construction. That's very alarming among people in the private sector. I don't know how that will impact upon them or on ourselves as individuals — but you can be sure that the cost is going to be passed along. For example, a private firm may pay a $200,000 a year premium for a $50 million professional liability policy. Certainly that goes into their overhead which is then passed on. We, who are in the government service or in the civilian service — although we may not be liable — should work through the professional organizations of which we are members to bring reason to this situation. We're the beneficiaries if we work for some degree of protection that would provide equity both for the people who are at risk as well as the people who have executed the design and construction. I wouldn't think it would be right for anyone in the engineering profession to try to be an advocate of total immunity from liability. But there ought to be at least some rock that you could cling to rather than just have this unlimited liability hanging over your head which then generates those high premiums and forces the cost to be passed on. Eventually the taxpayer picks it up.

ESQ: It is my understanding that we in the government have a kind of status and privilege as long as we do what's within our organizational charter and as long as we do what's in our job description. This privilege means that we cannot be sued with the same personal liability as someone on the outside. Still, the Federal government ultimately has to pay for it if the government is liable.

Mr. Rietman: There's some concern that government employees can be held liable for some of the things they do, even if it's within the scope of their work. The Senior Executives Association has been very concerned about that and it is on the agenda to get legislation that would at least protect individuals acting within the scope of their responsibilities from being sued for damages that would flow from those actions. That, too, seems logical, but, law and logic are not always the same thing.

ESQ: There's kind of a humanistic view of the Pentagon in that no matter what the function a person holds, even those who may be official adversaries really try to be friends. This view holds that the process of communications is facilitated by these peo-

ple. Is that the case?

Mr. Rietman: I think that's true with any organization. It's not just characteristic of the Pentagon. In most complex organizations there's always the wiring diagram and the chart relationship that's down on paper with a set of very clear lines. For any of these organizations there are the informal communications lines that don't necessarily follow the same lines you see on the chart. Certainly both are necessary. There has to be some recognized official channel of communication but that doesn't mean a lot of the information that's gathered through the informal, or the unstructured part of the organization is not equally as effective and does not serve a very real purpose. I don't know that we could function as easily, or as well, if we were rigidly bound to the communications lines that are in the organizational charts.

ESQ: Do you find it helpful to have the abilities to just sit down and informally discuss an issue with the interested people on the Hill, with the people of the secretariats, and with your counterpart elements?

Mr. Rietman: Sure. There's a need to be able to discuss things informally before they're reduced to formal positions. Where there is room for adjustment, there's certainly a benefit to talking before latching onto one line of action.

ESQ: In your years of being the senior civilian in E&S, you've probably developed a management philosophy. Would you share it with us?

"Registration is the hallmark of the engineering profession in the same way as being accepted to the bar is in law."

Mr. Rietman: It's not as much a management philosophy as it is a way of life. Make sure you know who your boss is. Make sure you understand what he wants and see to it that it gets done.

ESQ: How do you feel about the attractiveness of E&S careers to people coming in?

Mr. Rietman: You know, comparing the opportunities that I've had and what might be available to someone coming in now, certainly leads one to think that it is a different world and a different organization, looking broadly at the Federal government as well as specifically at engineering and services. Perhaps the same identical opportunities are not available. But, there are probably others that are just as attractive, just as challenging, that would be just as interesting to the individuals. I certainly didn't know what I was getting into when I came to work for engineering and services in the middle '50s . It was a decent job in an area in which I wanted to work. There was no one who held any great carrots in front of me that said, "If you do this and if you do that then you'll wind up here in 15 or 20 years." I don't know that I could do the same thing for any individual who would come in today. You just can't chart patterns like that or predict what the world's going to be like in five or 10 years. On the other hand, I don't think there's any reason to be pessimistic about it. The same types of interesting work and certainly interesting people are going to be there. And, I would hope that 20 years from now somebody would have the same things to say about it. They would be talking about the different items and they would be talking about different experiences, but I think they would probably be just as satisfied and find that the opportunities are still there for a very productive and fulfilling career.

ESQ: Brig. Gen. Joseph A. (Bud) Ahearn said during an interview that anyone going into programming should learn economics and political science. Many people were taken aback by his statement in the sense that, "It's true but it's not the expected reply." How do you feel about it? If you're talking to someone who aspires to be an advocate in the Pentagon, do you recommend his view?

Mr. Rietman: Certainly. You should add one more attribute to that statement. One that would be very useful would be to have a literary background. I have often seen good ideas ignored because of the inability to express ideas in writing and to communicate in an effective fashion; to say something precisely, concisely and effectively. It's a skill that is in short supply. You don't hear much emphasis given to it. We need that proper communicative ability. A program person could use that skill to great advantage. I've suggested many times that instead of hiring an engineer, we ought to hire a writer. It might be easier for our engineers to sit down and talk to someone, say like yourself, and have that individual transfer that discussion into written thought. Because, when you ask an engineer to do that, you must also know if they have a knack for writing. They can pick it up. But, that's not normally an area in which engineers are strong. When we're writing justifications and we're writing program directives we need somebody who can put down the right words. So, in addition to the political scientist and the economist that General Ahearn mentioned, I'd like to have a writer also.

ESQ: Is it hard for people to understand the way things work in the Pentagon?

Mr. Rietman: No, but it's sometimes hard to accept. I would never try to explain the Pentagon to anyone. Until you've actually been a part of a programming or a budget cycle — which is really what drives this building — you could tell people what's going to happen, but they might not believe you. I wouldn't blame them for not believing. There's a very great advantage for someone, reasonably early in their career, to be exposed to how both the major commands and the headquarters function. I think that's essential to their real growth. To be effective in the Air Force you've got to know how to get things accomplished and of course the budget is where everything comes from. As I said earlier, the test is not that we accomplish our mission in the Pentagon. The people who are here, I feel, have the responsibility to gain the resources and people for the operating bases of the Air Force. They — at the bases — accomplish the mission. There are certain practical limits that must be considered in carrying forward the requirements of the Air Force. There are also certain things that have to be done in a certain sequence to be effective. An early understanding of that can enhance anyone's career, both military and civilian.

ESQ: Can I quote something for you? "A closed mouth catches no flies." They were quoting Cervantes. The second quote is "You learn very little when your mouth is open . . ." Harry P. Rietman, 1965. Have you changed that philosophy?

Mr. Rietman: No, I repeat it to myself many times.

Biographical Data:

- **Born in Cincinnati in 1927;**
- **Went through public schools there then moved to Florida for a year in 1940-41;**
- **Moved to Washington in 1941;**
- **Graduated from public schools in Arlington, Va.;**
- **Enlisted in the Marine Corps in World War II;**
- **Upon completion of enlistment, attended Virginia Polytechnic Institute, was graduated in Civil Engineering in 1950 then returned for an advanced degree in 1953;**
- **Late fall of 1950 was called into service during the Korean conflict and served with the Army Corps of Engineers in Europe;**
- **After returning to civilian status was employed by the Navy in Washington;**
- **Joined the Air Staff, in a programming position, in 1955.**

Computer-Aided Building Space Planning: Its application in the architectural and engineering industry.

by Maj. Barry Kelly

[Editor's note: Major Kelly is assigned to U.S. Air Forces in Europe, Ramstein AB, Germany, after a 10-month assignment with Daniel, Mann, Johnson and Mendenhall, a Los Angeles-based architectural/engineering firm. He was one of about 135 officers in the U.S. Air Force Institute of Technology's Education With Industry (EWI) program. Our Fall 1981 issue of the *Quarterly* carried the article "Education With Industry: Sabbatical or Hard Work?" by one of the program's former participants who worked with DMJM.]

The Society for Computer Applications in Engineering, Planning and Architecture (CEPA) held its 36th semiannual conference in Denver, Colo., in the spring of 1982. Conferees from public and private practice spent two and one-half days in seminars, open discussions and technical presentations relating to their experiences, observations and opinions on the use of computers in engineering, planning and architecture. A highlight of the conference was a technical presentation by Schemmer Associates, Inc. (an architectural and engineering firm with offices in Omaha, Neb.) which adressed a unique solution to a space-planning problem.

Space planning is a topic of particular importance. As the A&E correctly noted, prevailing budgetary constraints will continue to force us to seek and evaluate alternatives to new construction while solving our building space needs. We are being forced to make more efficient use of our existing resources and to make better long-range plans for new facilities. Also, the decision to consolidate, reassign, or build additional space must be based on an accurate assessment of our present facilities. The A&E suggested a number of questions must be considered:

- What is the net assignable space in your facility?
- What is the demand for that space?
- What is the total space demand during a specified time frame?
- How much is used at peak demand?
- How can you maximize space usage?

The A&E's Problem

The A&E related his problem as the following: The Board of Governors of a metropolitan technical community college considered its needs:

- For new facilities;
- To renovate one of its historic campuses; and,
- To accomplish both while being under state budgetary constraints.

The job was to evaluate area-wide utilization of the college's three campuses, which serve a four-county area, in relation to the programs offered on each campus and correlated to the geographical areas in which the students reside. According to the A&E, the historic campus was evaluated using three considerations — present condition, code compatibility and functional effectiveness. The A&E used field research teams to determine the optimum use of each structure and estimated costs for optimum-use conversion. Its research included data on square footage, usage, capacity, life remaining in the building, cost of repair, cost of renovation and suitability for reuse.

Building utilization for the other two recently constructed campuses was included to complete the inventory of space and the survey of the conditions of space available. Space demand at each campus was analyzed by program, type of space, time of day, and day of the week to show the peak demand for net assignable classroom space for each day and each hour. Since the college was concerned about the proper location of new buildings, each of the three campuses was analyzed with respect to space demand and student traveling distances. All programs were plotted per campus by number of students, distance

Study Process

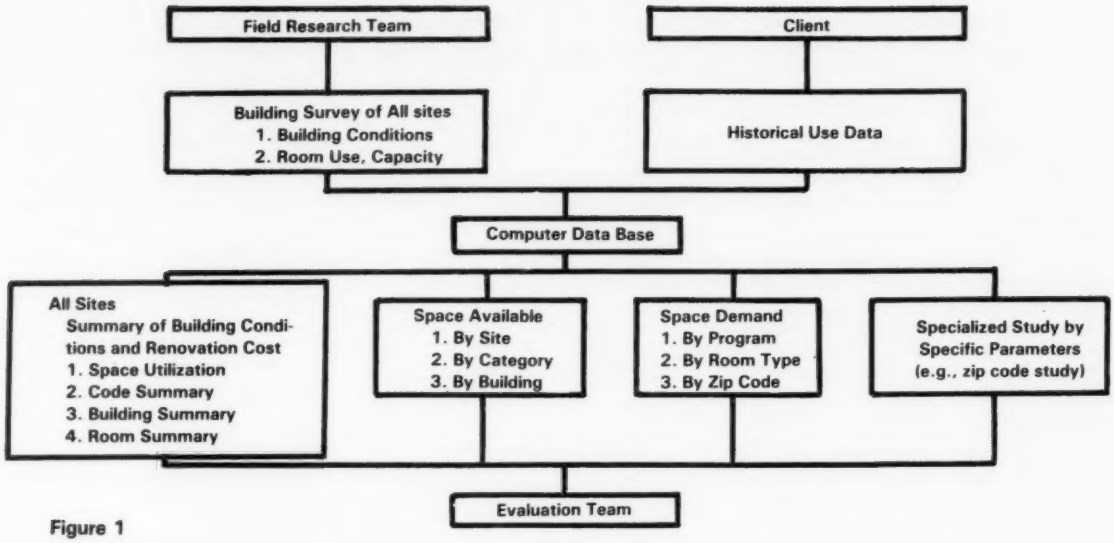


Figure 1

from the zip code centroid of each campus, the time of day, and day of the week.

As you can imagine, manual data manipulation would have been time consuming and costly to the client, and it probably would have led to subjective conclusions. The A&E was tasked with quickly providing his client with easily understood, accurate, and objective information on which to base sound decisions.

The Unique Solution

The tool that the A&E used was a computer-based facility analysis program it developed that could assist engineers to compile a massive amount of information and, as the A&E put it, "... could be used to make rational decisions on cost effectiveness and utilization of facilities, renovation benefits, requirements for new facilities, and projected ability to meet future needs." The process had three basic steps:

- Complete inventory and analysis of existing spaces,
- Determination of profile and space demand of each facility user and,
- Representation of space utilization over any given period. Figure 1 shows a flow chart illustrating this process in more detail.

Field research teams were able to categorize and record data in a short time, and it was later discovered that the computer program had the potential of using hand-held calculators programmed in conjunction with an office-based mainframe computer. According to the A&E, "... data can be input directly into the calculators in the field and quickly entered into the computer when the team returns to the office. The computer compiles the information, which is then summarized and printed out at all levels of the hierarchy from the overall complex to the individual room."

And the Client Gets...

The A&E reported its computer program provided the client with a sound basis on which to accomplish the following:

- Evaluate the scheduling use of existing facilities,
- Evaluate utilization of each type of space,
- Determine the best space utilization of existing facilities,
- Project overall space needs and
- Recommend methods of consolidation or expansion.

The computer product also provides a client with a data base that can be continually updated and analyzed in terms of future facility utilization. In the case of the first point above, Figure 2 shows the graph generated by the program. It shows how the client's "perceived" need for additional space was valid. (A&Es note: The number of students in relationship to the space used during the evening hours is accounted for by the larger number of traditional classroom-type courses offered at night. This is as opposed to labs and shops.)

The chart illustrates the relationship between the net assignable classroom space used and the number of students in attendance during the day. The line on the chart representing Optimum Net Assignable Classroom Space reflects existing space suitable for classroom use. The line representing Present Net Assignable Classroom Space is the total available space dedicated to classroom use.

The Computer's Future in Air Force Engineering

The A&E firm that developed the space planning program reported that this unique approach to space planning problems greatly increased its ability to evaluate mutli-facility complexes. The program reportedly has the capacity to summarize and analyze space utilization for 225,000

Maj. Barry Kelly served for a year with Daniel, Mann, Johnson & Mendenhall, Los Angeles, under the Air Force Institute of Technology's Education With Industry Program. He is currently assigned to Headquarters U.S. Air Forces in Europe. He earned the master of science degree in Architecture from the University of California and the bachelor's degree in Economics from Howard University.

rooms in a single project — 300 rooms per building-by-50 buildings per site-by-15 sites. This capacity can be expanded by multiples of 15 (i.e. 15 projects per site).

For centuries, architects and engineers have relied on the traditional T-square, pencil and triangle as their tools of the trade. Today's A&E firms in industry are making innovative uses of what has become a new tool of the trade to meet their specific needs. Wider use of computers in the construction industry is being partly driven by ever-increasing direct costs associated with planning, design and construction supervision.

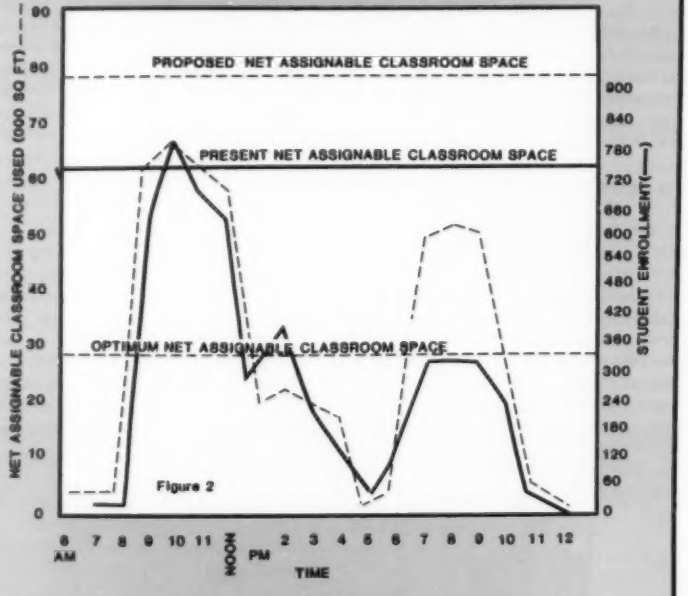
With the high cost of financing, it is increasingly common for clients to advertise a Request For Proposals with the stipulation that the prospective firms have computer-aided design and drafting (CADD) capability in order to reduce the cost of the designing effort. Interestingly, the U.S. Army Corps of Engineers and the Navy's Public Works have both, on occasion, sought A&E services through announcements in the ***Commerce Business Daily*** (issue numbers PSA 7955, November 1981 and PSA 8093, May 1982), specifying CADD experience as a factor to be used in evaluating prospective firms.

Firms represented at the CEPA conference were firmly committed to the use of CADD and reported great success in achieving faster and better designs, more accurate drafting and a reduced number of problems encountered during construction. This all adds up to more profitability for A&E and lower costs to the client. There has never been a better time for the Air Force to automate its engineering effort now that the phenominal advances in the microchip industry have placed sophisticated and powerful computers within the financial reach of even the hobbyist. Software packages on the market today cover a wide spectrum of time and money-saving applications. Typical of such are:

- Architectural design and drafting,
- Engineering analysis — structural, mechanical, civil and electrical,
- Interior layout planning,
- Construction cost estimating,
- Construction scheduling and,
- Construction management.

Good Business Sense

Although Air Force engineering organizations don't operate on a pure-profit motive, it can be said that every dollar we can trim off a project's budget is, in a sense, "profit" to the U.S. government which can be applied elsewhere. Be it master planning or programming and designing facilities to support the deployment of newly acquired weapons systems, the demonstration witnessed at the conference is a perfect example of the reason we should concentrate more effort on getting in step with our counterparts in industry by making common use of the computer throughout our engineering organizations.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TIME
Figure 2

Figure 2

PALACE BALANCE AND THE E&S COMMUNITY

Palance Balance is a personnel program designed to redistribute NCO overages into AFSCs with chronic critical NCO shortages.

During FY84, Engineering and Services people from six career fields (AFSCs) are targeted for retraining: 551X0 (Pavements), 551X1 (Equipment Operators), 552X4 (Painters), 571X1 (Firefighters), 611X0 (Services), and 622X0 (Food Service).

About 140 people volunteered to retrain from these AFSCs to date. This year, for the first time, MAJCOM functional managers will be able to submit Palace Balance exemption requests to AFMPC before involuntary retraining selections are made. This allows retention of exceptional individuals whose loss would be extremely detrimental to their career field. (AFESC/DEMG, CMSgt. Allen, AUTOVON 970-6400)

NEW AFESC DIRECTORATE FORMED

Bringing ideas to the field in the engineering and services community has been tough and haphazard in the past. E&S leadership has taken steps to rectify this situation by committing the resources to do something about it. The Product Management Directorate (PQ) was recently established at the Air Forces Engineering and Services Center, Tyndall AFB, Fla., to act as a focal point for requirements, identification and advocacy and to bridge the gap between product development and fielded capability. PQ is under the leadership of Lt. Col. Charles W. Evans and is comprised of two divisions.

The requirements division (PQR) ensures that E&S support requirements and limitations are fully identified as new Air Force operational concepts, weapon systems and equipment are developed. The division will also consolidate and support requirements through the E&S strategic planning process and sponsor the activities of the E&S Requirements Board. Chief of the requirements division is Capt. Doug Downey, AUTOVON 970-6138.

The role of the product management division (PQP) is management of the E&S product acquisitions. Emphasis is on the systems approach to ensure products are produced in correct quantities and configurations, deployed to the right places and the right time, and are supportable. Chief of the division is Capt. Pat Coullahan, AUTOVON 970-6295.

ESQworld

People, Places & Events of Interest

DoD, USAF ANNOUNCE ENVIRONMENTAL AWARDS

The 1983 Thomas D. White environmental awards have been presented to Robins AFB, Ga., Ramstein AB, Germany, Shaw AFB, S.C., and Murray O. Sant of Hill AFB, Utah.

Each year the awards recognize the top three base environmental quality and natural resources conservation programs, and the individual who has made the most outstanding contribution to Air Force natural resources conservation. Earning the Air Force awards automatically means nomination to the DoD for higher-level honors.

Robins AFB was named runner-up this year for the DoD environmental quality award. Secretary of Defense Caspar W. Weinberger also announced that Shaw AFB received honorable mention for the defense secretary's natural resources conservation award.

USAF Awards

Robins received the environmental quality award for its comprehensive program on industrial waste management. In 1982, Robins saved the Air Force more than $4.5 million through their recycling efforts.

The environmental quality award for an overseas installation was awarded to Ramstein. Ramstein is being honored for efforts in environmental management.

Shaw AFB won the natural resources conservation award. This base has shown concern for the environment with the installation of nature parks and landscaping as well as programs for beautification, outdoor recreation and community involvement.

The personal award for natural resources conservation was presented to Murray O. Sant, natural resources manager at Hill AFB. Sant conducted extensive eagle surveys on the 957,000-acre Utah test and training range in cooperation with the Bureau of Land Management and the Fish and Wildlife Service. He also established cooperative research programs on revegetating desert lands, landscaping on Hill AFB and initiated successful recycling programs.

These awards were established in 1959 in honor of the former Air Force chief of staff, who instituted the Air Force's first conservation program. The awards were presented originally for outstanding achievements in fish and wildlife conservation, but gradually were expanded to stimulate achievement and recognize commendable progress in pollution abatement and natural resources conservation.

Maj. Gen. H.L. Emanuel (left), former commandant of the Air Force Institute of Technology, presents the AFIT School of Civil Engineering Accolade to Maj. Gen. Clifton D. Wright Jr., Director of Engineering and Services, HQ USAF. The presentation was made at a recent AFIT Program Review Committee meeting at Wright-Patterson AFB, Ohio, in recognition of his outstanding support to civil engineering.

GEN. LAMB RETIRES

Brig. Gen. Charles W. Lamb retired on Aug. 1 after more than 30 years of active duty. His retirement certificate was presented to him in ceremonies at Norton AFB, Calif., by Lt. Gen. George D. Miller, the vice commander of the Strategic Air Command and a classmate from the U.S. Naval Academy class of 1953.

Before his retirement, General Lamb was the commander of the Air Force Regional Civil Engineer-Ballistic Missile Support, an agency which supports the Ballistic Missile Office at Norton AFB.

General Lamb was awarded the first Oak Leaf Cluster to the Distinguished Service Medal for his exceptionally meritorious service to the nation.

He was responsible for the design and construction of all facilities associated with the Peacekeeper missile system, such as maintenance shops, warehouses, roads, launch sites, test facilities, offices and dormitories. His duties also included preparing environmental impact statements, requesting construction funds from Congress, obtaining legal rights for water and real estate, and coordinating Air Force plans with state and local government officials. In the local area, General Lamb negotiated the Air Force's purchase of the $11 million San Bernardino county office complex.

General Lamb served the nation throughout the most critical phases of the evolution of the Peacekeeper missile system, including developing numerous basing mode alternatives leading to a national concensus.

Most recently, General Lamb's office started the design of missile facilities to

Gen. Lamb Retires

Continued

permit deployment of Peacekeeper in Minuteman silos in Wyoming and Nebraska.

Commissioned in the Air Force in 1953 following graduation from the U.S. Naval Academy, he later earned bachelor and master of science degrees in civil engineering from the University of Oklahoma. He served in Alaska, Massachusetts, and Florida. He also served in headquarters assignments in Germany, Vietnam, Washington, D.C., Hawaii, Texas, and Ohio.

General Lamb served as the deputy chief of staff for engineering and services at both Air Training Command headquarters in Texas and Air Force Logistics Command headquarters in Ohio. At each assignment he was responsibile for operations and maintenance of billions of dollars of Air Force real property.

"SCHOOL HOUSE" 35-YEARS-OLD

The Air Force School of Civil Engineering celebrated its 35th anniversary in June concurrent with the annual meeting of the Program Review Committee that oversees and makes recommendations on the school's curriculum.

Since the PRC meeting is a "mini-worldwide" conference of the Air Force Engineering and Services leadership, the celebration turned into a gala event.

The formal dinner was held at the Dayton, Ohio, Engineers' Club, founded in 1914 and at one time the unofficial officers' club for flyers.

James F. Boatright, deputy assistant Secretary of the Air Force for Installations, Environment and Safety gave the keynote speech. He said that the installations of the Air Force are in fact warfighting platforms, making the challenge to Air Force civil engineering awesome. Launch and recovery of Air Force weapons systems, he noted, depends upon facilities which are ready to carry out their wartime mission. The civil engineering school, he noted, is essential, educating engineers to the task of operating, maintaining and building facilities to support the Air Force mission.

Col. Phil Compton, dean of the school, noted that school was created in 1948 to ease the transition of the Air Force engineering mission from the Army Corps of Engineers. For five years the only course covered policy, regulations, management and operations and maintenance. Beginning in 1953, special course interests began, leading to today's curriculum of 29 resident courses offered to 2,500 resident students and 3,000 non-resident students.

Gen. Lustig Retires

Brig. Gen. Sheldon J. Lustig, deputy chief of staff, Engineering and Services, U.S. Air Forces in Europe, retired from active duty in ceremonies on May 12 before Gen. Billy M. Minter, Commander-in-chief USAFE, and was awarded the Distinguished Service Medal for his outstanding contributions to defense.

"The honors awarded to me reflect the quality and dedication of my people," said General Lustig. "The USAFE E&S team is the finest with which I have had the honor to serve."

He was cited for leading a massive E&S involvement in:

★ Beddown of the Ground-Launched Cruise Missile;

★ Beddown of the F-16;

★ Carrying on the extensive hardening programs;

★ Supporting programming, design, construction and facilities improvements in Liberia, Oman, Morocco and Egypt;

★ Supporting rapid deployments of the U.S. forces into lands where American airmen had not served for decades;

★ Bringing realistic combat training to Prime BEEF/RIBS forces to prepare them for their wartime role; and

★ Working to greatly improve materials support to the E&S forces under USAFE, in peace and war.

The E&S achievements he points to with greatest pride measurably improve the quality of life available to Air Force people and their families assigned to USAFE. Among these were:

★ Commissaries — Three new facilities were completed, two are underway at Ramstein AB and Camp New Amsterdam, and 14 are programmed for the next four years;

★ Exchanges — Developed the first list of priorities for AAFES, totalling more than 118 projects valued at $50,000 or more each;

★ Dining Halls — Started a systematic program of renovations, with a project underway at Torrejon AB; projects scheduled for Zweibrucken AB, Camp New Amsterdam, and RAF Alconbury; and a major project associated with the new professional military education facility at RAF Upper Heyford, which includes a new dining hall and two new dorms.

★ Housing — 800 units are programmed for Incirlik, 200 of them now complete. One hundred have been completed at RAF Greenham Common, and major renovation projects are in progress throughout USAFE.

★ Billeting — Established a command-wide billeting requirements pool, now involving $6 million in transient facilities improvements with an additional $2 million programmed.

★ Temporary Lodging Facilities — One TLF has been completed at Incirlik and another is close to completion, part of a command-wide emphasis on the temporary lodging needs of people and their families. The coming years include new facilities at San Vito AS and RAF Bentwaters.

★ Food Service — In the face of tremendous challenges involving long logistical lines to support equipment and language problems affecting equipment operation and understanding of the program, successfully brought on the Air Force A La Carte system.

A major challenge has been the assignment of junior enlisted people to Europe, having limited available shipment poundage for PCS travel. There is now a $1 million program to furnish these families with appliances at no charge.

General Lustig was awarded the Newman Medal by the Society of American Military Engineers for his engineering accomplishments.

FY84 Professional Continuing Education Course Offerings

AFIT School of Civil Engineering — Wright-Patterson AFB, Ohio 45433

MANAGEMENT APPLICATIONS COURSES

MGT 001, Base Civil Engineering (2 weeks): *For the newly assigned officer and civilian.*

MGT 002, Commanders Civil Engineering Orientation (1 week): *For wing and base commanders and deputies.*

MGT 004, Environmental Protection Committee Members (1 week): *For EPC members.*

MGT 400, Base Civil Engineering Staff Officer (2 weeks): *For BCEs and deputy BCEs. Class 84A is designed primarily for experienced BCEs; Class 84B for newly assigned BCEs.*

MGT 403, Industrial Engineering Management Applications (2 weeks): *For chiefs of industrial engineering branches.*

MGT 406, Family Housing Management Application (2 weeks): *For chiefs and personnel in family housing management.*

MGT 415, Contract Preparation (2 weeks): *For architects and design engineers in EEP.*

MGT 416, Financial Management Applications (2 weeks): *For CE funds managers.*

MGT 420, Engineering and Environmental Planning Management Applications (2 weeks): *For chiefs of EEP branches.*

MGT 424, Real Property Management (2 weeks): *For real property management officers.*

MGT 425, Contract Management (2 weeks): *For architects, construction management, and design engineers in EEP.*

MGT 427, Fire Protection Management Applications (2 weeks): *For base fire chiefs and deputy fire chiefs.*

MGT 430, Operations Management Applications (2 weeks): *For chiefs and deputies of operations branches.*

MGT 438, Readiness and Logistics (2 weeks): *For vehicle control officers, Prime BEEF and materiel control officers.*

MGT 520, Environmental and Contract Planning (3 weeks): *For base development planners.*

TECHNICAL APPLICATIONS COURSES

ENG 400, Construction Cost Estimating (2 weeks): *For CE personnel involved with estimating costs of Military Construction Program (MCP) and O&M projects.*

ENG 440, Built-up Roofing (1 week): *For roofing program managers, design engineers involved in roofing specifications.*

ENG 460, Mechanical Engineering for Supervisors (2 weeks): *For engineer supervisors in EEP and operations branches.*

ENG 470, Electrical Engineering for Supervisors (2 weeks): *For engineer supervisors in EEP and operations branches.*

ENG 472, Engineering for EMCS (2 weeks): *For systems engineers in the operations branch.*

ENG 480, Building Systems (3 weeks): *For engineers/architects in EEP branch.*

ENG 485, Contingency Engineering (2 weeks): *For all CE officers with mobility or base recovery roles. Class 84D, 2 weeks, is designed primarily for Air National Guard/AF Reserve.*

ENG 490, Architectural Planning (2½ weeks): *For architects, architectural engineers and engineers performing architectural design.*

ENG 500, Environmental/Sanitary Engineering (3 weeks): *For civil and sanitary engineers.*

ENG 550, Pavement Engineering (3 weeks): *For pavement engineers.*

ENG 561 HVAC (4 weeks): *For design engineers.*

ENG 563, Facility Energy Systems (3 weeks): *For experienced mechanical engineers.*

ENG 571, Electrical Engineering (4 weeks): *For design engineers.*

ENG 590, Corrosion Control (2 weeks): *For corrosion engineers.*

ENG 595, Industrial Water Treatment (3 weeks): *For practicing engineers involved in corrosion and scaling control.*

Services Career Field Educational Opportunities

by Maj. Dick Flack and Capt. Rick Kennedy

As a services officer you have several opportunities available to further your education. The educational building blocks which will help strengthen your goals professionally as well as your career goals can be obtained through programs offered by the Air Training Command (ATC) and the Air Force Institute of Technology (AFIT). This article will briefly describe the different programs that are provided. From this you should be able to map out your educational goals which you should also communicate on your AF Form 90, Career Objective Statement.

A good starting point would be completing one or more of the various courses offered at the Lowry Technical Training Center, Lowry AFB, Colo. The Services Training Branch at Lowry provides the technical training for those specialties within the Services career field. These courses vary in length from one to three weeks and include training for staff and operations officers, billeting manager and food service officer. Selection to attend these courses is closely coordinated between the base services personnel, their MAJCOM, and the services career monitor in PALACE BLUEPRINT at the Air Force Manpower and Personnel Center (AFMPC). Details of the courses offered should be obtained through the Service Training Branch at Lowry AFB.

A slight departure from the technical training at Lowry would be AFIT's Education With Industry (EWI). This program is designed to have you work with industry for nine months. Hands-on training can occur while you serve within one of the participating hotel, retail or food industries at a predetermined commercial location. This allows you to add a new dimension to your management technique that will benefit you and enhance your future job experiences. You apply for EWI by requesting program S-83 on your AF Form 90, then contacting PALACE BLUEPRINT. The selection process is accomplished by the AFIT Selection Board at AFMPC.

A finale to your educational opportunities would be obtaining a master's degree in the hospitality area. An advanced degree is a very important part of an officer's overall personnel record. In today's Air Force more than 43 percent of all support officers have master's degrees (See Figure 1).

Each year two services officers are selected for participation in services' AFIT master's programs. Selections are made through a board process. In order to be eligible you should accomplish the following:

1. Complete a new AF Form 90 requesting an AFIT-sponsored master's degree in education code 1AIY.

2. Request a review of your college transcript by AFIT through your local education office to certify your academic eligibility. You must have a minimum of 2.5 on a 4.0 scale for your overall grade point average.

3. Take the Graduate Management Admission Test (GMAT). This test is given only four times per year. Have your scores reported to AFIT as well as any university that has a graduate level hospitality program (i.e., Cornell University, Florida International University, and Michigan State University).

4. Contact the PALACE BLUEPRINT Services Career Monitor at AFMPC to indicate your interest in the program (AV 487-2768).

The actual selection is based on a review of your academic record by AFIT and a review of your military record by AFMPC. Your career monitor in PALACE BLUEPRINT can give you a relatively good assessment of your military record and your timing of a request for selection to the master's program. If you meet these basic requirements, your record will be sent to the selection board for a final decision. The board will review the AFIT recommendation, your resource manager's comments and your military record.

Selections are made between November and January for input into the master's program for the following August or September period. This timing is needed to allow the selectees to process applications to the various academic institutes. Most universities require admission applications be processed by March or April of the requested admission year. In many cases letters of recommendation, GMAT scores, college transcripts, interviews, and other tests are required in the basic application. For example, Cornell University requires your application by Feb. 1 with all supporting documents to be submitted by Mar. 1 for Sept. 1 class entry. The length of the master's program at the different universities varies from 15 to 21 months.

The Master of Professional Studies

Maj. Dick Flack is the chief of the Subsistence Division, Headquarters Air Force Commissary Service, Kelly AFB, Texas. He was assigned there from the Air Force Institute of Technology's graduate program at Cornell University, where he earned the master of professional studies degree in Hotel Administration.

FIGURE 1

COMPARISON OF OFFICERS WITH MASTERS DEGREES

(Measured in Percent)

Rank	WWS	AFL	SERVICES
Col.	69	68	80
Lt. Col.	74	69	69
Maj.	78	68	65
Capt.	47	36	32
Lt.	15	7	6
Total	43%	38%	30%

WWS — World Wide Support or all Air Force Support Officers
AFL — Air Force Line or all Line Officers (Rated and Support)

FIGURE 2

REQUIRED COURSES CORNELL GRADUATE MPS PROGRAM

COURSE	HRS.
Graduate Food Chemistry	4
Food and Beverage Management	3
Graduate Operational Food Production Systems	3
Sanitation in Food Service Operations	2
Computers and Hotel Computing Applications	3
Project Development and Construction	3
Graduate Studies in Electrical and Mechanical Systems	3
Law of Innkeeping	3
Marketing Management	3
Managerial Accounting in the Hospitality Industry	3
Graduate Corporate Finance	4
Monograph Research	3
Monograph	2
Total	39 Hrs.

Capt. Rick Kennedy is a food services officer presently attending Cornell University and working towards a master of science degree in Hotel/Food Service Management. He holds a bachelor's and master's degree in Business Administration Management from the University of Oklahoma. He is a graduate from Squadron Officer School (in residence).

(MPS) offered at Cornell University and Florida International University's master's of science (MS) degrees are similar in course content. A master of business administration (MBA) program is offered at Michigan State. To illustrate a typical hospitality master's program, we will highlight the MPS program at Cornell University.

The Cornell MPS Hotel Administration degree requires four full semesters totaling 64 credit hours, a 10-week summer practical work experience, and a monograph thesis. All students are required to have hospitality experience as well as certain academic prerequisite courses. The graduate curriculum has 39 specifically required credits and 25 elective credits (See Figure 2). Students can utilize elective credit hours to concentrate in additional areas of interest. For example, if you recognize more of the services functions are becoming computerized you could take several more courses in that particular area. For more detailed information on the graduate program at Cornell University write: Graduate Faculty Representative, School of Hotel Administration, Cornell University, Statler Hall, Ithaca, N.Y. 14853.

As a final note, the School of Hotel Administration at Cornell University also offers a number of short courses during the summer (June and July). This program provides valuable information to supervisors and managers. There are a number of courses that could be applied to the military hospitality system (See Figure 3). For more information write: Center for Professional Development, Statler Hall, Cornell University, Ithaca, N.Y. 14853.

These courses could be used as incentive programs. They can help strengthen an organization that is having difficulty moving forward. They could also serve as a reward to an outstanding unit and provide additional information to improve even more in the future. The Military Airlift Command has used this program for its billeting people and MAC may be asked for an appraisal of the courses. The funding and authorization to attend these courses would have to be coordinated through ATC.

Presently we have a number of educational opportunities available to the services people. It is now up to you to aggressively pursue these educational building blocks and use them. From such opportunities we will continue to see the services career field grow stronger both as a profession and in the services provided.

FIGURE 3

PROFESSIONAL DEVELOPMENT COURSES

Examples of Relevant Courses

H01—Hotel/Motel Inn Operations
H02—Principles of Hotel Management
H03—Front Office Operations
H04—House Keeper Operations
H21—Introduction to Front Office Accounting
H25—Food and Beverage Control
H33—Meat Science and Management
H71—Computing Systems
H73—Computer Applications in the Hotel Industry
H74—Computer Applications in the Food Service Industry

For Additional Information and Brochures Contact:
Maureen C. McKenna
Administrator External Affairs
School of Hotel Administration
Cornell University
Statler Hall
Ithaca, N.Y. 14853
NOTE: Course fees include housing.

Directorate of Engineering and Services

Current Emphasis

a brief commentary on significant developments

HVAC IMPROVEMENT INITIATIVES NOW UNDERWAY INCLUDE:

- Base evaluation teams, comprised of upper management and technical personnel, formulating plans and tracking progress toward improved maintenance; also developing a formalized training plan for all HVAC personnel via contract and Air Force-taught courses and OJT.
- CEMIRT assistance to base teams through hands-on training in controls.
- Sheppard TTC revision of the basic HVAC controls course in time for the first class next month (October); and initating a new advanced HVAC controls course with a March, 1984, projected start. (AFESC/DEMM, Mr. Wilson, AUTOVON 970-6361)

ARCHITECTURAL COMPATIBILITY PROGRAM –

HQ USAF/LEE issued a June 16 policy letter initiating an Air Force-wide architectural compatibility program. The objective is to enhance mission effectiveness by providing an environment that is both functionally efficient and aesthetically pleasing. The program is to be implemented through architectural compatibility guidelines developed by each installation. A sample statement of work for consultant services, based upon successful efforts at Air Force Logistics Command bases, is being sent to all MAJCOMs. (AF/LEEVX, Mr. Sevcik, AUTOVON 297-6242)

CONTRACTING OFFICES TO STOP USING DEFENSE ACQUISITION REGULATION –

The AF and DoD plan to implement the existing Federal Acquisition Regulation (FAR) effective 1 April 84. DoD and AF will supplement the FAR; meanwhile base level activities should be working closely with Contracting Offices to insure new contracts conform to the FAR. The Air Staff action office for the implementation is AF/RDCL. (AF/LEEPP, Maj. Marshall, AUTOVON 225-7744).

MANAGING O&M MINOR CONSTRUCTION –

The authority for $200,000 O&M minor construction projects expands our flexibility to support the Air Force mission. Approval of the increased authority was not without Congressional concerns that we would use that flexibility to divert funds from maintenance and repair. As a result, the Congress now requires an annual report on O&M funding for minor construction, with an eye toward more oversight if they feel that the services are abusing the new authority. To preclude a situation from developing where our flexibility is greatly reduced, Air Force policy is that no more than 15 percent of each major command's facility project-by-contract program may be spent for minor construction. Only in cases of critical exigency will consideration be given to exceeding the threshold. (AF/LEEPP, Maj. Junkin, AUTOVON 225-7774)

ANNUAL INSPECTIONS OF INSTALLATION BOUNDARIES –

Physical annual boundary inspections as required by paragraph 5-4 of AFM 93-1 (C13) are necessary to prevent encroachment on Air Force-owned or controlled land. Emphasis must be placed on the inspection of Air Force property held by easements, leases, and other lesser interests. These interests are usually outside the installation fence and encroachments can be overlooked if the Real Property Officer is not familiar with property documents. (HQ USAF/LEER, Mr. Peele, AUTOVON 297-6234)

INTERIM MANPOWER APPLICATIONS INSTRUCTIONS (AFMS 44XX) –

A letter, mailed from AFESMET July 29, provides guidance for civil engineering and manpower on the implementation of the Work Information Management System (WIMS) into the industrial engineering organization. The final Air Force manpower standard (AFMS) for Functional Code 4403 and others affected by the reorganization is expected to be published in early 1984. (AFESC/DEMG, Mr. McDaniel, AUTOVON 970-6396)

ENERGY CONSERVATION OPPORTUNITY PROGRAM –

(Reference E&S *Quarterly* article, Spring 1983) The purpose of the ECOP is to help us identify good facility energy retrofit investments in a minimum amount of time. ECOP-I, for military family housing, was used successfully by 80 percent of our bases. ECOP-II, for small industrial facilities, is under development now by the AFESC Energy Group. We expect ECOP-II to be available Air Force-wide in early 1984. (AFESC/DEB, Maj. Cardinale, AUTOVON 970-6463)

UTILITY RATES TEAM –

The Air Force utility rates management team at AFESC has recently been supplemented with two full-time attorneys to assist with rate intervention and other rate related matters. A third attorney will further enhance the Air Force's ability to effectively intervene in rate cases. He will join the team in December. Continued emphasis is needed on timely reporting of any new utility rate increase. (AFESC/DEMM, Mr. Gildersleeve, AUTOVON 970-6356)

1983 RED HORSE COMMANDERS WORKSHOP –

The AFESC Directorate of Readiness will co-host the annual workshop with the 823rd CESHR at Hurlburt Field, Fla., Oct. 31 thru Nov. 2, 1983. The workshop will continue emphasis on RED HORSE programs that have been revitalized since the last conference in May 1982. Workshop attendees will be limited to RED HORSE commanders and MAJCOM representatives. (AFESC/DEOP, SMSgt. Bolin, AUTOVON 970-6127)

IMPROVING ADVANCEMENT OPPORTUNITIES –

The Engineering and Service Civilian Career Management Program (ESCCMP) is now referring names for use in filling career program position vacancies. This means two things. 1) You must be registered in the program to be considered for these positions (even if the position vacancy is at your present location). 2) Your skills coding must be adequate and correct to ensure you're considered for referral. The responsibility for ensuring proper skills coding is half yours! The ESCCMP Skills Codes Definitions Handbook should be used to determine which skills codes should be used. (OCPO/MPKCE, Mr. Johnson, AUTOVON 487-6843)

HELP ON THE WAY FOR Prime BEEF MANAGERS/NCOs –

AFP 93-7, "Prime BEEF Manager's Handbook," will be available to the field in the first quarter of FY84. The pamphlet is a guide for establishing and managing the Prime BEEF Program. It explains what has to be done and how to do it. Some of the topics covered are: BCE, Prime BEEF manager/NCO and team chief responsibilities; equipment accountability and aquisition; development of MOP 23 and checklists; establishing and scheduling training; managing teams; UNITREP; load plans; list of reference publications and fliers; and a list of spare parts for the CF-2 team kit. AFESC/DEO will notify each MAJCOM when AFP 93-7 is available. Place your order through your local PDO. (AFESC/DEO, Maj. McClusky, AUTOVON 970-6130)

ENGINEERING AND SERVICES INFORMATION MANAGEMENT SYSTEMS –

A draft of the work information management system and the services information management system technical specification was completed August 4. Industry ability to meet the needs outlined in the specification will be learned after the specification is released by the Air Force Computer Acquisition Center. The formal request for proposals will be released in December with proposals from industry due at AFCAC in April 1984. (AFESC/AD, Maj. Hamill, AUTOVON 970-6437)

SERVICES INFORMATION MANAGEMENT SYSTEM –

A SIMS prototype will be tested in November at Davis-Monthan AFB, Ariz. A "tiger team" developed SIMS software at AFESC from April to June. On the team were people from Strategic Air Command, Pacific Air Forces, Air Force Logistics Command, Air Force Systems Command, Tactical Air Command, Air Training Command, Military Airlift Command, Air Force Data Systems Design Center, the U.S. Army Natick Laboratories and AFESC. SIMS benefits from earlier computer applications including the Automated Air Force Food Service Operations Systems (AFSOS), and the Automated Billeting and Reservation System (ABARS). Target date for worldwide SIMS implementation is early 1985. (AFESC/AD, Capt. Cox, AUTOVON 970-6205)

HOUSE DOCTOR

Saving Housing Energy Through Infiltration Reduction

by Maj. Jim McEvoy

Air Force housing may be suffering from a condition that costs millions of dollars. Fortunately, once properly diagnosed, the condition is normally reversible and can be remedied through minor surgery.

The condition has a syndrome associated with it: loss of energy, alternating sensations of hot and cold, a sensitivity to drafts, and an appalling insensitivity to the ultimate costs. The condition is excessive air leakage.

Some of this loss is necessary for health reasons because homes must "breathe" to rid themselves of odors and combustion gases. Any leakage beyond this safe-breathing level means wasted energy. The exact amount of loss due to infiltration is unique to each home. However, research has shown that "average" homes have an infiltration loss of 20-40 percent of the total heating and cooling load — much more than is really needed. In order to reduce this energy loss, the excess infiltration must be reduced.

The Solution

We can reduce infiltration through the pressurization method or "house doctor," as the procedure is generically known. This new procedure uses a blower door (described further in this article) and can show where we can save a great amount of energy. The door serves two purposes. First, it detects existing leaks making their "fix" quite simple through the use of caulk, weather stripping and tape. Second, through its instrumentation, it ensures a safe infiltration level is not violated during the sealing process. The cost of this procedure is very reasonable. Tests have shown Air Force homes can be done for around $300 per unit with an average payback in about five years. But, it is not economical for all bases. Factors such as annual heat load, cost of heating fuel and number of degree days must be reviewed. For those bases that want to see where they stand, Headquarters Air Force Engineering and Services Center (AFESC/DEB) has a computer program and a nomograph that calculate the economics of house doctor. The nomograph and computer data input sheet are contained in an AFESC Energy Techdata Sheet.

If the economics look good, a base can generate a house doctor project for family housing using P-722 or MFH Energy Conservation Investment Program (ECIP) funding. Design time is minimal and a generic statement of work and specifications, available from AFESC/DEB, are readily adaptable to any base.

A base can realize up to 15 percent savings in military family housing energy and a resultant few percentage points on the base's overall consumption by employing house doctor. Infiltration reduction with house doctor is an effective energy saving project and, if the economics are favorable, it should be pursued.

How it Works

The blower door is a high-flow fan, mounted on a plywood panel, which is temporarily installed in an exterior doorway of a home. It has expandable metal sections that make it adaptable to almost any doorway, and can be installed in minutes without removing the permanent door. The home can be either pressurized or depressurized, causing a steady air leakage through existing cracks and openings. Leaks that may be obscure under natural infiltration conditions (without the fan) become obvious under a negative indoor pressure. Once detected, leaks can be eliminated.

Measurements are done by maintaining a constant negative pressure, usually .2 inches of water or 50 Pascals [12.5 Pascals (Pa) = .05 inches of water]. This slight vacuum is measured by using a magnehelic gauge which is part of the blower door's instrument package. An initial reading is taken at the beginning of the procedure using data from the fan's RPM meter and the gauge. The RPM, pressure, and calibration curve for the fan are used to determine air flow (Q) through the fan. By correcting this airflow for the volume of the home, an air change per hour (ACPH) is determined (ACPH = Q/V). ACPH is the number of times per hour a home completely changes its air.

The ACPH figure is a key element in the house doctor program. It is used to determine safe levels of infiltration, and is a value that can be reduced by a certain percentage, through retrofit actions. This quantified reduction can then be converted into energy and dollar savings.

Leak detection may be accomplished by several methods used together or separately. Infrared thermography, smoke pencils, or touch/hearing senses may be used. The effectiveness of the three methods have been tested and, for the degree of reduction desired, all three are acceptable. Obviously, not all three cost the same. In contracting to have this procedure performed in housing areas, one must be careful not to specify the contractor's method for leak identification. How the contractor identifies his leaks should be of no concern; only that he does identify them, fixes them using specified and approved materials, and fixes enough of them to bring about a desired level of infiltration reduction. All this must be done in a reasonable amount of time.

Research suggests that a 40 percent reduction in infiltration is desirable, obtainable by a contractor, and provides sufficient energy savings to make the procedure cost effective at the majority of bases. The 40 percent reduction is calculated using initial and final ACPH values, where a 40 percent reduction in ACPH equates to a 40 percent reduction in infiltration. The initial and final values must be calculated from data collected at the same pressure and obtained on the same day.

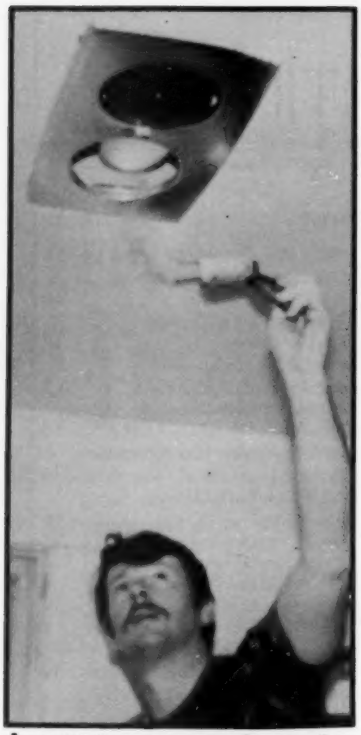
The 40 percent does have a caveat. At a pressure of 50 Pascals, the minimum number of ACPH that will still allow a safe infiltration level in the home is seven. Therefore, one should achieve a 40 percent reduction or 7 ACPH, which ever occurs first during the procedure.

There are unique cases where we could reach 7 ACPH before a 40 percent reduction is achieved. This occurs when a home's initial ACPH is less than 11.7. We are willing to attempt some homes in this category, but draw the line at 10 ACPH or less. The exact criteria is covered in the Energy Techdata Sheet.

An Assumption

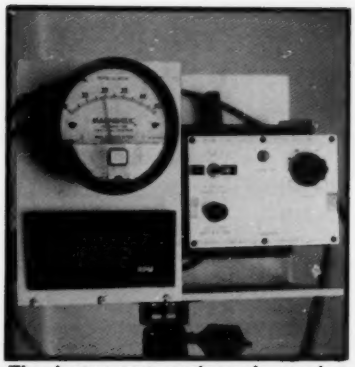
In determining the economics of this procedure, the home's existing infiltration rate is assumed. The precise value can be obtained for each home using the tracer gas method. This method uses SF_6 (sulfur hexaflouride) gas and is performed under natural conditions (no fan). A known amount of gas is injected into the air in the home and air samples are taken every half hour for two hours using inflatable gas bags. Sampling equipment determines the concentration of gas in each sample and a rate of decay. This decay in concentration is caused by the home's air change process. Using the rate of decay, a home's volume, and weather data, an infiltration rate under natural conditions can be determined. However, this procedure is costly and time consuming and is not economically feasible to pursue.

The natural infiltration is derived from non-pressurized, naturally occurring in-



A contractor uses a smoke pencil to find leaks around a light fixture.

Maj. James F. McEvoy is force development project officer with the Readiness Directorate at the Air Force Engineering and Services Center, Tyndall AFB, Fla. He was previously assigned to the Center's Energy Group where he worked with energy awareness, the Air Force 10-Year energy plan and energy conservation. He was also project officer for the house doctor program. He holds a bachelor of science degree in Electrical Engineering from Grove City College, Pa., and a master's degree in Business Administration from Webster College, Mo. Before joining the E&S community, Major McEvoy was a C-141 navigator.



The instrument package is used to help quantify a 40% reduction in infiltration.

filtration. Since blower door measurements are taken under pressure, the blower door procedure is of no use in determining the natural infiltration.

Since the actual infiltration rate is so difficult to obtain, we have settled on a 30 percent leakage rate for all MFH's for all economic calculations. This decision is made on the assumption that all Air Force homes leak as much as average civilian homes. With the 30 percent infiltration rate and the 40 percent infiltration reduction figure, the economics can be calculated.

The Economics

The economics have been calculated in both a nomograph and a computer product — the nomograph is for use at base-level and the computer product is generated at AFESC using data from bases. Both tools arrive at the same answer, but the computer product is in a life-cycle cost analysis (LCCA) format that satisfies ECIP criteria. The nomograph is more of a planning tool to see if a base's pursuit of house doctor is warranted. If it looks favorable, a computer run is the next step.

The Computer Product

The computer product is more specific and its product is in the ECIP life-cycle cost analysis format. The program can be run for each specific house and fuel type (one form per type), if desired, but the best results would be achieved by using average housing data and only have one request for each type of fuel. Since projects would cover the entire housing area, an average value for the entire base would show the economics more realistically.

Funding

In testing this procedure, funding through P-722 (MFH maintenance and repair) and ECIP was used. Both are acceptable ways to fund the projects, but P-722 is probably the better avenue since this work falls into the same category as floor sanding and painting and will probably be done at occupancy turn-over.

The Statement of Work (SOW)

SOW's were tested at McGuire AFB, N.J., and Tyndall AFB, Fla., and were found to be very effective. The resultant generic SOW, available from AFESC/DEB, should be applicable to all bases, with minor changes.

Contract Monitoring

Contract monitoring is another area a base will have to give a little extra attention. Since this is a new procedure, chances are slim that any of our contract inspectors have ever seen a blower door, let alone monitored a blower door contract. Simple things must be monitored closely if accurate results are to be obtained, such as ensuring all windows in the home are closed during the initial reading or ensuring the magnehelic gauge is connected properly. A handbook (available from AFESC/DEB) covers the operation of the blower door and identifies inspection points for our monitors. It also contains a chart that shows how to determine a 40 percent reduction for any initial reading at any pressure for any type of blower door. This relieves the inspector from having to do the air flow calculations. This handbook is a must for inspectors who will monitor a house doctor contract.

Energy Techdata Sheet

All information in this article is available through an AFESC Energy Techdata Sheet which has been distributed to all bases. Additional copies are available from AFESC/DEB.

How effective is the house doctor program? Well, let's assume a base uses at least 100 MBTU/year to heat a home (ignoring the savings from air conditioning), pays $5/MBTU for their heating fuel, $300 per home for their contract, and experiences 6,000 heating degree days per year. This base will have a savings to investment ratio of 1.5 and a simple payback of 5.2 years through the use of house doctor. Almost all northern bases should be good candidates for this work. However, even the Tyndall AFB test had a payback of 6.7 years, showing we can still make money on some southern bases. House doctor saves energy and should be considered as an energy saving tool at each base. Remember, plugging the gaps can remedy one of the most serious syndromes affecting the Air Force energy program — excess infiltration.

Technical Training Centers

1984 COURSE LISTING

Sheppard TTC

TITLE	COURSE LENGTH
CE Solid State Applications	20 (DAYS)
Electrician	34
CE Electronic Systems	80
Intrusion Alarm Systems	8
JSIIDS Installation and Maintenance	10
Cathodic Protection Maintenance	8
Fire Alarm Systems	8
Fire Alarm Systems	15
Electric Power Line Specialist	40
High Voltage Cable Splicing and Terminating	5
Airfield Approach Lighting — Condenser Discharge	8
Electric Distribution System Maintenance	30
Underground Cable Testing	5
Power Line Safety Requirements	5
Electrical Power Production Specialist	45
Arresting Barriers	6
Uninterruptable Power Supply (Exide)	30
Uninterruptible Power Supply (Teledyne-Inet)	30
Diesel Engine Overhaul and Generator Set Opr.	20
Aircraft Arresting Barriers, BAK-9/MA-1A	5
Aircraft Arresting Barrier, BAK-12	6
Aircraft Arresting Barriers, MA-1A/BAK-9/BAK-12	7
Hook Cable Support System, BAK-14	7
Troubleshooting Elec. Power Generating Equip.	10
Refrigeration and Cryogenics Specialist	51
Air Conditioning Controls	22
Refrigeration and Cryogenics Technician	50
Heating Systems Specialist	38
Boiler Water Treatment and Corrosion Control	5
Boiler Plant Equipment Mechanic	5
Heating Systems Technician	18
Civil Engineering Control Systems Specialist	30
HVAC Controls	20
Contract Construction Inspector	26
Base Civil Engineer Supervisor	12
Construction Inspector	5
Contract Construction Inspector	8
Pavements Maintenance Specialist	20
Pavements Maintenance Technician	15
Construction Equipment Operator	55
Snow Removal & Ice Control Equipment	4
Construction Equip. Technician (RED HORSE)	10
Carpentry Specialist	27
Roofing Repair (Built Up)	5
Masonry Specialist	23
Metal Fabricating Specialist	38
Gas and Arc Welding	20
Fabricating Welded Pipe Joints	12
Plumbing Specialist	27
Backflow Prevention Devices Testing	4
Natural Gas Distribution System Maintenance	6
Fire Suppression System Maintenance	13
Natural Gas Distribution System Maintenance	5
Engineering Assistant Specialist	55
Engineering Assistant Technician	41
Concrete Inspection (TIMCCI)	5
Flexible Pavements Inspection (TIMFPI)	5
Civil Engineering Resources Management Spec.	18
Base Engineer Automated Management Systems-BEAMS	9
Production Control Specialist	23
Civil Engineering Work Planning	13
Engineered Performance Standards	10
Engineered Performance Standards (Refresher)	4
Pest Management Specialist	27
Vegetation and Turf Management	19
Pest Management (Recertification)	5
Pest Management (Recertification)	5
Plant Pest Management	10
Bird/Aircraft Strike Hazard (BASH)	5
Pest Management Technician	30
Environmental Support Specialist	35
Field Water Purification Plant, Ops. (600 GPH)	4
ROWPU Operation and Maintenance (600 GPH)	4
Wastewater Plant Operator	15
Water Plants and Systems	18

Chanute TTC

TITLE	COURSE LENGTH
Liquid Fuel System Hydrant	19
LFM Specialist (Conventional Fuels)	40
Petroleum Tank Cleaning Familiarization	2
Petrol. Tank Clean-Safety Requirements and Equip.	5
Petroleum Tank Cleaning Supervisor	10
LFM Technician (Conventional Fuels)	10
Petroleum Tank Cleaning Supervisor	10
Fire Protection Specialist	31
Crash Firefighter	9
Fire Protection Orientation	4
Structural Firefighting	11
A/S32P-4 Fire Truck Operation	5
A/32P-4/P-2 Fire Truck Operation	10
Fire Protection Specialist (Munitions)	7
Firefighter Rescueman	12
A/S32P-2 Firefighting Vehicle Operator	10
A/32P-4 Fire Truck Operation	8
A/S32P-15 Fire Truck Operation	8
Advanced Fire Protection Technology	10
Fire Prevention Inspector	15
Fire Investigation	8
Fire Protection Management Principles (under development)	15

Lowry TTC

Quality Assurance Evaluator	4
Managing Quality Assurance for Svc Contracts	5
Base Civil Engineering Material Control	11
Services Supervisor	10
Services Staff Officer	7
Mortuary Affairs Officer	5
Services Operations Officer	15
Billeting Management	15
Billeting Management (Mobile Training)	15
Food Service Specialist	44
Air Force A La Carte Feeding (block of 62270CS)	5
Food Service Supervisor	21
Food Service Officer	14

Course descriptions and numbers are contained in AFM 50-5, USAF Formal Schools Catalog. Requests for quotas are processed through the supporting CBPO for military members, or the CCPO for civil service members.

tecnotes

CIRCULAR FLUORESCENT FIXTURES for use as replacements for incandescent bulbs have the following national stock numbers: 6250010806536 – 22 watt – FCA 22 WW (Part No.); and 6250010806535 – 44 watt – FCA 44 SW (Part No.). (AFESC/DEMM, Mr. Mixon, AUTOVON 970-6342)

BLAST ABSORBING STRUCTURAL SYSTEMS (BLASS) are the subject of a draft technical report now being reviewed. A new concept in conventional weapon blast-resisting technology, blast energy is absorbed through a partial failure of a system of structural panels and supports, thus protecting people, shelters and equipment located behind BLASS. The novel application of the system is that failure is isolated in replaceable energy-absorbing supports. (AFESC/RDCS, Mr. Buchholtz, AUTOVON 970-6270)

ENERGY SECURITY – A draft of the technical report on the AFLC energy vulnerability assessment is currently in review. This effort is focusing on the existing supply and distribution systems which feed Wright-Patterson AFB and Newark AFB in Ohio, and the five major air logistics centers. At each location, an assessment was made of the potential to interrupt this energy supply and technical opportunities to minimize its effects. Energy requirements for critical activities were also identified and gas turbines were recommended as the optimum near-term backup power systems. (AFESC/RDCS, Capt. Vitucci, AUTOVON 970-6276)

AIRCRAFT SKIN PENETRATOR – A lightweight, hand-held, self-powered aircraft skin penetrator is being developed and tested. It will penetrate aircraft skin in three to 11 seconds and discharge fire extinguishing agent at a rate of five pounds per second. The device will enhance access to and control of interior fires aboard aircraft. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

RESCUE TOOL – A lightweight, individually-operated, multiuse spark-suppressing rescue tool, capable of being used by one firefighter in a hazardous environment, is being developed. The tool combines the capabilities of the current Hurst tool and rescue saw into a single device. The device uses compressed air to drive hydraulic power, eliminating the problem associated with using gasoline engines in flammable environments. The tool will improve the ease of operation and increase the level of safety for both firefighters and occupants. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

REBREATHER – The U.S. Bureau of Mines awarded a commercial contract in 1982 to construct a 16-pound, three-inch profile, two-hour rebreather using the Air Force design concept. This apparatus will improve firefighter safety and increase operability in the chemical warfare environment. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

SAFECAN – A concept for an automatic computer cabinet and trash receptacle fire extinguisher has been developed. The concept calls for a small heat activated extinguisher to be placed in the computer cabinet or on the trash receptacle. The device, when activated, discharges an agent and sounds an acoustic horn. The horn activates a wall-mounted receiver which, in turn, activates the facility alarm system. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

FIRE VEHICLE SIMULATOR – A concept study has been completed and prototype development is underway to construct a full-size fire vehicle simulator. The increased environmental restrictions on the open burning of hydrocarbon fuels and the increased maintenance cost for our firefighting vehicles have placed significant constraints on firefighter training. These difficulties will be reduced by the use of the simulator to supplement the current limitations on live fire training. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

HARDENED AIRCRAFT SHELTER SYSTEM – A program is underway to develop and test a detection/suppression system for hardened aircraft shelters. The system is expected to detect and extinguish any anticipated fire in these shelters within 15 seconds. (AFESC/RDCS, Mr. Walker, AUTOVON 970-6283)

Engineering and Services Career Programs Now Operational

by Charles T. Johnson

The Engineering and Services Civilian Career Management Program (ESCCMP) is now operational and off to a good start. May 4, 1983, the ESCCMP issued its first certificates of names. The certificates were issued for a vacancy in the deputy base civil engineer position at Scott AFB, Ill. The promotion certificate contained the names of 10 promotion candidates representing four commands; eight were off-base candidates, and one was a woman. The reassignment/change-to-lower grade certificate contained five candidates; one was an off-base candidate and two commands were represented.

Col. Wesley D. Nottingham, Scott AFB's civil engineer, made the ESCCMP's first selection. May 25, 1983, he selected Bruce W. MacDonald, Headquarters Air Force Engineering and Services Center, Tyndall AFB, Fla., for the job of deputy base civil engineer. Colonel Nottingham reported to the ESCCMP career management team at Randolph AFB, Texas, that he was impressed with the timeliness of service (the team took 10 days to issue the certificate after receipt of the request), the quality and number of candidates.

Certificates covering 15 positions were issued during the first two months of operation. The referral program is expanding every month, and is expected to be referring candidates for all positions covered by the program by the end of 1983. As of July referral certificates were being issued for the following vacancies: Deputy base civil engineer, EMCS engineer, base and MAJCOM industrial engineer, billeting officer, housing specialist/manager, MAJCOM deputy chief of engineering and chief of technical designs. The positions advertised covered about 60 percent of the types of positions involved in ESCCMP. All told, there are 968 positions covered by the program.

Along the employee development lines, the ESCCMP master development plans (MDPs) and career patterns (CPs) have been prepared in draft. MDPs are documents that graphically show what jobs, training and educational experiences are required or desirable for progression in the employee's field (e.g. engineering, architecture, housing, services and realty). The information on these MDPs is detailed. Employees can use MDPs as guides in filling out their individual development plans (IDPs). For the first time, E&S employees will know the training, educational courses and job development assignments which are the most beneficial for advancement. Career patterns are graphic depictions of the numbers/types of E&S positions available and the normal progression patterns. These allow individuals to "chart" careers, knowing their relative opportunities by the number and grade of positions available. We expect to have these MDPs and CPs to the field in late 1983.

The ESCCMP is off the ground to a good start in both the staffing and employee development areas. Minorities and women are appearing on the vast majority of issued certificates. Representation of the various commands has been good and most candidates have agreed to be referred when we call them to assume availability. The quality of candidates has ranged from good to excellent. Most certificates have had a good amount of candidates. Most promotion certificates have had at least 10 names. Most reassignment/change-to-lower grade certificates have had about five names. Seventy-five percent of selections to date have been off-base candidates.

While the ESCCMP has come a long way, we still have a way to go. We'd like to thank all those individuals in the E&S community who have supported the program and taken part in its development. We'll look forward to your continued support as we develop a career program that will meet its main objective — to develop highly talented supervisors and managers to assume leadership in the engineering and services mission.

Department of the Air Force
AF Engineering & Services Quarterly
HQ AFESC
Tyndall AFB, Florida 32403

Postage and Fees Paid
Third Class Bulk Rate

U.S.MAIL

☆ U.S. Government Printing Office: 1983-646-107/3